AN

ANALOGICAL INDEX

TO THE

SUBJECTS CONTAINED IN THE TWENTY-THREE VOLUMES,

COMPRISING THE

FIRST AND SECOND SERIES,

OF THE

LONDON JOURNAL

OF

Arts and Sciences;

EMBRACING

DESCRIPTIONS OF EVERY INVENTION PROTECTED BY PATENT RIGHT IN ENGLAND FROM THE BEGINNING OF THE YEAR 1820 TO 1830, WITH A GREAT VARIETY OF OTHER INTERESTING SUBJECTS

CONNECTED WITH

ARTS AND MANUFACTURES.

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PREFACE.

THE incalculable usefulness of a work that should contain descriptions of ALL the various inventions connected with the Arts, Sciences, and Manufactures, which become the subjects of PATENT RIGHTS in England, induced the Editor, in the beginning of the year 1820, to undertake the task of giving, through the medium of the "London Journal of Arts and Sciences," explanatory reports of the principles, properties, and construction of *every new patented invention;* and, notwithstanding the heavy expense and the unforeseen difficulties which have presented themselves in the accomplishment of this object, it is with much pleasure he acknowledges that the liberal patronage of the public have enabled him effectually to prosecute his plan, and to state from time to time, in the progress of the work, that up to certain periods he has faithfully described in the pages of his Journal the specification of EVERY NEW PATENT INVENTION.

The further advantages of presenting at one view concise notices arranged ANALOGICALLY of the general features of every PATENT INVENTION within a given series of years, with references to the volumes of that Journal in which they are severally described in detail, led to the formation of the following Index.

The analogical plan adopted in this Index presents at once to the reader, in a consecutive form, all the subjects that have reference to any particular branch of the Arts, Sciences, or

Manufactures, which have been protected by Patents in England, as well as many other inventions from foreign sources connected with similar objects.

This Index extends over a space of ten years, referring to the twenty-three volumes which constitute the First and Second Series of the "London Journal of Arts and Sciences;" in which are comprehended, among an extensive miscellany of other matters, descriptions with numerous plates of all the SPECIFICATIONS OF PATENTS granted in England, from the beginning of the year 1820 to 1830.

As the "London Journal and Repertory of Arts, Sciences, and Manufactures," in its present Conjoined Series, proceeds upon the same plan as the former division of the work—viz., that of reporting every SPECIFICATION—it is intended, after the close of the year 1840, to publish a similar analogical Index of the subsequent inventions, in order that the fullest information may be communicated to the public of the progress and actual state of improvement in the various branches of the Arts, Sciences, and Manufactures.

THE

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OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXXVIII.

Recent Patents.

To RICHARD SMITH *and* RICHARD HACKING, *both of Bury, in the county of Lancaster, machine-makers, for certain improvements in machinery or apparatus for drawing, slubbing, roving, and spinning cotton, wool, flax, silk, and other fibrous substances.*—[Sealed 13th March, 1840.]

THESE improvements consist, firstly,—in the novel application of certain parts or pieces of mechanism to such machines employed in the preparation and spinning of cotton and other fibrous substances, known as "drawing, slubbing, and roving frames," or machines; and also to those spinning machines called "throstles."

The particular object of the improvements, is to change the speed of the drawing-rollers to a greater or less number of revolutions per minute, so that more or less twist may be given to the yarn during the operation of drawing, slubbing, roving, or spinning, and thus varying its fineness or "number," without making any alteration in the toothed gearing. This is effected by means of a strap or belt, pass-

ing around cone pullies, in connection with the roller gearing, which, when shifted along the conical peripheries of the pullies, alters the speed of their driving power, as may be required.

Secondly.—These improvements consist in causing the same variable driving apparatus, to act (by means of suitable intermediate gearing) upon the ordinary "copping" rail or apparatus in such machines, in order that the rise and fall of the "copper" may be simultaneously adjusted in speed, to accommodate the change in the draft and twist; but, as this will be so evident to the practical spinner, it needs no further explanation.

Thirdly.—These improvements consist in the application of a novel contrivance to such machinery, for the purpose of converting an ordinary continuous circular motion,—as for instance, a common toothed wheel and pinion, into a reciprocating rotary motion, or mangle wheel and pinion, as occasion may require, in the copping motion of such machines; so that it will be seen, that the continuous circular motion may be retained any required time, and thus the lift of the copper be continued for any space, according to the length of the bobbin, and then the same motion may be instantly changed into the reciprocating or that of the mangle wheel and pinion, and thus the return or lowering of the copper may be effected, at any required period.

In Plate I., the improvements are shewn attached to an ordinary spinning machine or throstle, which has been done merely by way of illustration, as it will be readily observed, that it is precisely similar, in its application and effect, to the preparing machines used in the process of drawing, slubbing, and roving.

Fig. 1, is a plan or horizontal view of a throstle, as seen from above; fig. 2, is an end elevation, taken at the line A, B, in fig. 1, or having the end frame removed, to shew the new parts more clearly; fig. 3, is a vertical section, taken transversely at the line C, D, in fig. 1; and fig. 4, is a vertical section, taken longitudinally at the line E, F, in fig. 1.

The framing of the machine is shewn at *a, a, a, a,* sup-

porting the rollers *b, b,* and spindles *c, c,* and all the ordinary parts of the machine. The main driving-shaft *d, d,* carries a pulley *e,* around which a strap passes, and also around another pulley *f,* mounted upon the shaft *g.* To this shaft *g,* a cone pulley *h,* is keyed, and over it a strap or belt 1, is passed, which proceeds to another cone pulley *i,* for the purpose of communicating rotary motion thereto. Upon the shaft of the pulley *i,* is a pinion *k,* taking into a wheel *l,* of twice its diameter, mounted upon the shaft of another cone pulley *m,* for the purpose of reducing the speed of the main driving-shaft to the required speed of the drawing-rollers, with which those cone pullies are in connection. The cone pulley *m,* is mounted upon a shaft *n,* which is supported, at one end, by the carrier *o,* and at the other by the end-framing *a*; upon which end of the shaft is keyed a pinion *p,* taking into the ordinary front-roller gearing *p**.

A strap or belt 2, proceeds from the cone pulley *m,* to another cone pulley *q,* running loosely also upon the shaft *g*; upon this shaft is also keyed a pinion *r,* gearing with the wheel *s,* mounted upon the shaft *t*; upon the end of which there is a pinion *u,* gearing into the wheel *v,* the stud of which carries a pinion *w,* driving a pair of wheels *x, x,* taking into the ordinary back-roller gearing.

The two cone pulley-straps 1, and 2, run between the forked strap-guides *y, y,* fixed to the slides and slide-rod *z, z,* which move upon the parallel guide-rods 3, 3; thus it will be seen, that the only action requisite to alter the speed of the roller-gearing and the front and back rollers, is to slide the rod *z,* either way, and pass the straps 1, and 2, either upon the larger or smaller diameters of the cone pullies, and consequently alter the speed of their rotation, and with them that of the roller-gearing.

Now it will also be seen, that the same motion of the series of cone pullies and roller-gearing, acts at the same time, and in a similar manner, upon the copping apparatus, in order to vary the speed and action of such mechanism, simultaneously with that of the drawing-rollers, by means of the copping apparatus, being actuated by a worm 4,

keyed upon the shaft of one of the wheels *p**, driving the front-roller gearing.

The third feature of the improvements is seen at fig. 5, which is a side view of the wheel for regulating the lift or length of the cop, and is shewn, in its relative position, in figs. 2 and 4, at 5. Fig. 6, is an edge view of the same. *a, a,* is an ordinary ring of teeth or pins, to be worked by the pinion 6, at the bottom of the diagonal shaft 7; so that it will be seen, that as long as the copping-rail is required to be lifted, the wheel continues its ordinary rotary motion; but as soon as the lift is completed, any stop or lever, in connection with the machine, may be caused to strike against the part *b,* of this wheel, and cause it to swivel upon a centre-pin a fourth of a revolution, and thus leave a passage in the ring of pins or teeth, for the pinion to travel round from the back to the front of the wheel *a, a,* and thus to change the ordinary circular motion into a mangle wheel, and impart a returning or reciprocating action to the wheel *a, a,* and effect the lowering of the copping-rail. The part *b,* is shewn by dots, in the edge-view, as turned round, and the passage for the pinion open, as in an ordinary mangle motion. The swivel part *b,* is held firmly in its proper position by means of the tail-spring *c,* acting upon a square, formed at the end of its centre-pin.

The patentees claim the peculiar method of changing the speed of the drawing-rollers, and the copping motion, in the manner and for the purpose herein particularly set forth and shewn in the drawings; and also the peculiar construction of a toothed wheel, with a portion of the rim of teeth moveable upon a centre-pin, in order that it may be employed for a continuous circular motion, or a mangle-wheel motion, as found desirable in such machinery.—[*Inrolled in the Petty Bag Office, September,* 1840.]

Specification drawn by Messrs. Newton and Son.

To Richard Smith *and* Richard Hacking, *both of Bury, in the county of Lancaster, machine-makers, for certain improvements in the construction of machinery for spinning cotton and other fibrous substances.*—[Sealed 16th March, 1840.]

These improvements consist in a novel arrangement and construction of mechanism, adapted for the purpose of rendering the driving head-stock of those particular spinning machines called "mules," self-acting.

As the various requisite evolutions of the mule are well understood by persons conversant with spinning, it is only requisite to describe those particular movements which are affected by this improved construction of head-stock:—

Firstly.—"The going-out of the carriage," which commences in all mules simultaneously with the delivery of the cotton from the drawing-rollers, and the rotation of the spindles, and terminates when the "stretch" is completed, or the carriage, with the spindles, has arrived at its furthest destination from the drawing-rollers, when the rotation of the rollers cease, and the revolution of the spindles continues a short period.

Secondly.—"The backing-off" or uncoiling of the few spiral turns of yarn which are left on the bare or upper part of the spindle, during the process of spinning, which is accomplished by reversing the direction of the revolution of the spindles.

Thirdly.—"The winding-on" of the yarn to the spindle, in the form of a cop, which is required to be uniform in its tension throughout the different circumferences of the cop, during the "going-in" of the carriage.

Fourthly.—"The going-in" of the carriage, which proceeds simultaneously with the winding-on of the yarn, and takes the carriage again up to the drawing-rollers, when the mule is in a position to perform another stretch, or recommence its operation.

The principal feature of the improvements, is to perform these four movements, by means of the friction of contact

of certain rollers or pullies, each in connection with certain mechanism for performing such motions, respectively, at the required period.

The other requisite movements of the mule, such as "depressing the fallers," or driving of the spindles, may be done in the usual manner.

In Plate II., fig. 1, is a plan or horizontal view of a self-acting mule head-stock, as seen from above; fig. 2, a side elevation of the same, the carriage end being shewn in section; fig. 3, is a vertical section, taken longitudinally through the head-stock; and fig. 4, is an end elevation of the same.

The framing of the head-stock is shewn at A, A; the carriage B, B, with the spindles C, C, run upon the rails D, D, taking the yarn from the drawing-rollers E, mounted upon the roller-beam F, as usual.

The main driving-pulley G, is keyed upon the main cross-shaft H, which has a pulley I, at the other end, and a strap J, extending around it, and the pulley K, upon the other cross-shaft L, for driving the spindles.

The going-out of the carriage is effected as follows:—When the main driving-shaft G, revolves, a bevilled friction-pulley *a*, covered with leather or other friction surfaces, acts against a friction bevilled pulley *b*, which is brought in immediate contact with it: when the carriage, after having performed the previous stretch, is run in, this bevilled pulley *b*, slides upon a feathered shaft *c*, and now causes that shaft to revolve, carrying with it a bevilled pinion *d*, fixed at its other end, which drives the bevilled wheel *e*, at the upper end of the vertical shaft *f*, (see fig. 2); upon the lower end of this shaft *f*, is keyed another bevilled pinion *g*, driving the bevilled wheel *h*, upon the end of the horizontal shaft *i*, which extends the whole length of the carriage-race; a small toothed pinion *j*, upon this shaft, gears with a toothed wheel *k*, upon the side of which is a notched wheel *l*, around which the chain *m*, passes, and into which it gears. One end of the chain *m*, is screwed to the back of the carriage B, and after passing round the wheel *l*, proceeds around a grooved pulley *n*, at the further end of

the stretch, and thence back again to the carriage; and thus, as long as the bevilled friction-pullies *a*, and *b*, are in contact, the carriage will continue to run out.

The wheels *j*, *k*, and *l*, are repeated at each end and in the middle of the carriage, in order that the same may be properly secured or adjusted; and the vertical shaft *f*, is furnished with a pair of mitre-wheels *o*, *o*, and spur-wheels *o**, *o**, in order to drive the drawing-rollers E. The carriage being now run out, the contact of the friction-pullies *a*, and *b*, has to be discontinued, in order that the backing-off may be performed; this is done by means of the worm *p*, being keyed upon the driving-shaft H, and driving the worm-wheel *q*, upon the end of the shaft *r*; upon the other end of which there is a bevilled pinion *s*, gearing in the wheel *t*, upon the cam-shaft *u*. As this shaft *u*, is caused to revolve, it actuates the cam or tappet *v*, which is fixed upon it, and depresses one end of the catch-lever *w*, which vibrates upon its fulcrum *x*, (seen best in fig. 3,) and raises the catch *y*, at the other end, from the end of the retaining-rod *z*, which has hitherto held the friction-pullies *a*, and *b*, in contact, whilst the carriage was running out, by pressing against the pulley *b*, by means of the upright arm 1; and the continued revolution of the cam-shaft *v*, will then bring the cam or tappet 2, in contact with the arm 3, vibrating on its centre-pin 4, and thus, by means of pulling the rod 5, and chains 6, round the chain-pullies 7, will draw the friction-pulley *b*, away from the pulley *a*, and thus the going-out motion will cease, owing to their contact being discontinued.

The backing-off motion is accomplished by means of the cam or tappet 8, fixed at the end of the cam-shaft *u*, as it revolves, striking the pin 9, upon one end of the slide-rod 10; at the other end of the rod 10, is an inclined plane 11, which, as the rod is slidden inwards, strikes an upright lever 12, connected by means of the rod 13, to the shaft 14, of the winding-on pulley. This shaft 14, is also connected by means of the link 15, to the shaft 16, of the backing-off pulley 17, which is, by means of the inclined-plane 11, brought into contact with the large driving friction-pulley 18, at the same time the winding-on pulley is released.

The pulley 17, now begins to revolve, thus causing the strap-pulley 19, (also keyed upon the shaft 16,) to revolve with it, and by means of the strap 20, also causes the pulley 21, to revolve. This pulley is keyed upon the shaft 22, upon the end of which is a toothed pinion 23, driving the wheel 24, upon the end of the clutch-shaft 25.

At the same time that the backing-off pulley 17, has been brought into contact with the friction-pulley 18, as just described, the forked lever 26, has been caused to vibrate upon its fulcrum 27, by the action of the same inclined plane 11, and thus throw the clutch 28, into gear, causing the band-pulley 29, to revolve, and thus actuate the endless band 30. This band 30, also passes around another band-pulley 31; from thence round a guide-pulley 32, and round the tin drum 33, which thus causes the drum to make one revolution in a contrary direction, and back-off the yarn upon the spindle 34.

In order that there may be less backing-off, as the diameter of the cop increases, the pulley 17, is made to traverse towards the centre of the pulley 18, as the cop increases, and thus lose speed, by means of the click 35, turning the ratchet 36, which is upon the end of the screw 37; to this screw is attached the frame 38, to the upper end of which a fork catches hold of the boss of the pulley 17, and slides that pulley, upon its shaft, along the friction surface of the pulley 18, once during the formation of an entire cop, which is moved back by hand when the cops are doffed.

The machine is now in a position to wind on the yarn to the spindles, which is done simultaneously with the going-in of the carriage.

It will be remembered, that the bevilled friction pullies *a*, and *b*, were separated when the going-out of the carriage was completed; and the instant such separation takes place, the flat periphery of the pulley *b*, is drawn against the covered friction surface of the large pulley 18, and is thus immediately driven in the reverse direction, which it is evident will cause the carriage to be run in by reversing the draft of the carriage-chains *m*, *m*; and at this exact period, the tappet 8, has escaped the pin 9, upon the rod 10, and

allowed the weight 39, to slide the rod 10, again outwards, and thus releasing the backing-off pulley 17, and bringing the winding-on pulley 40, into contact with the large pulley 18, in which position they are drawn in fig. 1.

The winding-on pulley is now made to revolve, by the friction of contact, and also carries upon its shaft 41, the strap-pulley 42, from which the strap 43, passes to the pulley 44, upon one end of the shaft 45. Upon the other end of this shaft is keyed the bevilled pinion 46, gearing with the wheel 47, which is loose upon the shaft L, until the winding-on commences, when it is made fast to the shaft, by means of the clutch-box 48, being thrown into gear with it; the strap J, having being previously passed upon the loose pulley K*, by means of a strap-lever; thus the shaft L, is caused to revolve, and by means of the band-pulley 31, upon it, to cause the band 30, to turn the spindles in the proper direction, and thus wind on the yarn.

Fig. 5, is a detached view of the clutch-box 48, shewing its internal construction. To decrease the speed of the winding-on motion, as the cop-bottom increases in diameter, the winding-on pulley 40, is traversed upon the shaft 41, towards the centre of the large friction-pulley 18, by means of the mitre-wheels o, o, driven by the vertical shaft *f*, by means of the pinion 49, upon the shaft of the spur-wheel *o**, driving the spur-wheel 50, mounted on a stud, fixed to the framing A. This spur-wheel 50, is provided with a crank-pin 51, to which a connecting rod 52, is attached; and as the wheel 50, revolves, it gives reciprocating motion to the rod 52, and vibrates the mortice-lever 53, upon its fulcrum 54. The other end of the lever 53, is attached to a sliding-bar 55, to which is attached a fork, taking hold of the boss of the winding-on pulley 40.

In order to accommodate the winding-on to the peculiar build or shape of the cop, the lower end of the fulcrum 54, forms the nut of a screw 56, which is turned, in order to shift the fulcrum 54, and thus vary the traverse of the winding-on wheel, by means of the click and ratchet 57.

The going-out of the carriage, the backing-off of the yarn, and the winding-on of the yarn, and of course the

depression of the fallers, having now been completed, it only remains to place the machine in a proper position, to commence another stretch of the carriage. This is accomplished by bringing the bevilled friction-pulley *b*, again into contact with the friction-pulley *a*. A stop-piece 58, fixed to the back of the carriage, strikes, at the end of every stretch, a lever 59, carrying a friction-roller 60; this roller is thus thrown against the rod 61, and pulls the chain-rod 62, which is attached, at the joint 63, to the sliding retaining-rod *x*, *x*, when the catch *w*, falls, and holds the friction-pullies *a*, and *b*, in contact, when the evolutions of the head-stock proceed as before.—[*Inrolled in the Petty Bag Office, September*, 1840.]

Specification drawn by Messrs. Newton and Son.

To ALFRED JEFFERY, *late of Prospect-place, New Hampton, Middlesex, but now of No.* 8, *Lloyd-street, Pentonville, Gent., for a new method of defending the sheathing of ships, and of protecting their sides and bottoms.*—[Sealed 29th April, 1841.]

THIS invention consists in the production of various solutions and mixtures, for preparing oakum for caulking, and paying the seams, and coating the sheathing of ships.

The solutions are three in number, viz., turpentine caoutchouc solution, naphtha caoutchouc solution, and coal-oil caoutchouc solution.

The turpentine caoutchouc solution is formed by dissolving one part, by weight, of caoutchouc, in twelve parts, by weight, of spirits of turpentine.

The naphtha caoutchouc solution consists of one part of caoutchouc, dissolved in twelve parts of rectified coal naphtha.

The coal-oil caoutchouc solution is produced by dissolving caoutchouc in coal-oil, the proportions being the same as in the two former solutions.

The mixtures are asphalte mixtures, Nos. 1 and 2, and lac mixtures, Nos. 1 and 2.

The asphalte mixture, No. 1, consists of two parts, by weight, of powdered asphalte, dissolved in one part of the naphtha caoutchouc solution.

The asphalte mixture, No. 2, is composed of two parts, by weight, of asphalte, dissolved in one part of the coal-oil caoutchouc solution, and to four parts of this mixture, one part of a solution of corrosive sublimate is added. This solution is prepared by dissolving two parts of powdered corrosive sublimate, in three parts of white naphtha, in a glazed earthenware vessel, and then adding three parts of coal-oil to it.

The lac mixtures, Nos. 1 and 2, are prepared in a similar manner to the asphalte mixtures, with this exception, that lac is employed instead of asphalte.

Oakum is prepared for caulking by soaking it in either the turpentine or naphtha caoutchouc solutions; the superfluous solution is then pressed out, the fibres separated, and the oakum being dried, is ready for use. The asphalte mixture, No. 1, or the lac mixture, No. 1, is used for paying the seams.

The sides and bottoms of ships are protected by a coating of the asphalte or lac mixtures, one-eighth of an inch thick; either of the mixtures No. 1, may be applied to the parts above water, or for the first coat of the parts below water; but one of the mixtures No. 2, must be used for the remaining coats, which the under parts of the vessels receive. The mixtures are applied, when hot, by means of a brush, each coat being allowed to dry before the following one is laid on, and the surface of the last coat is smoothed by the application of heat.

The patentee claims, firstly, the method, by the means herein described, of defending the sheathing of ships, and of protecting their sides and bottoms; secondly, the application of caoutchouc for the same purpose; and thirdly, the application of lac for effecting the same object.—[*Inrolled in the Petty Bag Office, October*, 1841.]

To Edward Hammond Bentall, *of Heybridge, in the county of Essex, iron-founder and agricultural implement-maker, for certain improvements in ploughs.*—[Sealed 10th June, 1841.]

These improvements in ploughs consist, in the first instance, in the peculiar construction and mode of adapting an adjustable lever to the frame of a plough, such adjustment being for the purpose of changing the inclination of the share, which is attached to the end or nose of the lever, so that the point of the share may stand at any required angle below or above the level of the sole, slade, or ground of the plough, and thereby be made to take a greater or less depth in the soil.

Secondly.—In the peculiar forms of the shares, and modes of attaching them to such adjustable levers.

Thirdly.—In the mode of affixing the breast or mould-board to the plough, in order that it may rise and fall with the adjustable lever and share.

Fourthly.—In the means of contracting or expanding the breasts of a double-breast plough, when such double-breast is cast or formed in one piece.

In Plate I., fig. 1, represents, in elevation, the frame *a, a, a,* of one of the improved ploughs, (the breast being removed, in order to shew the parts behind); *b, b,* is the adjustable lever, to which the share *c,* is attached; and *d,* is the sole, slade, or ground of the plough.

Fig. 2, represents the form of the under part of the sole, slade, or ground *d,* and of the share *c,* when attached; the shape of the under side of the frame *a,* and of the nose of the lever *b,* being represented by dots.

Fig. 3, shews the form of the under side of the lever *b,* near its nose, and fig. 4, that of the frame *a.*

Fig. 5, is a section upon an enlarged scale, taken vertically through the fore part of the frame *a,* and through the fore part of the lever *b,* shewing the manner in which the lever and the frame are connected together, at bottom, by a loose bolt *g.*

The lever *b*, has a transverse groove *e*, cut in its under part, which, when applied to the frame, as seen in fig. 5, bears upon a ridge *f*, and thereby allows the lever to vibrate, in a small degree, upon the frame, the ridge *f*, being its joint or fulcrum. The lever and frame are held together, at this part, by a loose pin or bolt *g*, having a dove-tailed head, which pin is passed through corresponding holes in the frame and lever,—a counter-sunk recess, in the under part of the frame, receiving the head of the bolt, and a nut *h*, screwed on to the reverse end of the bolt, keeping the lever and frame in connection.

The upper part of the lever *b*, shewn in fig. 1, is connected to the frame by a bolt *i*, fixed in the end of the lever, and passed through a hole in the ear *k*, having two nuts screwed on to the bolt, at opposite sides of the ear.

The share *c*, is slidden on to the nose of the lever *b*, and is fastened thereto by a bolt *l*, (see figs. 1 and 2,) which is passed through a hole in the lever.

The lever and share being thus attached to the frame of the plough, if the point of the share is required to go deeper into the ground than the level of the sole, the nuts are turned further on to the screw of the bolt *i*, which brings the upper end of the lever nearer to the ear *k*, and, consequently, depresses the nose of the lever and the share, as shewn by dots in fig. 1, the lever turning upon the ridge *f*, as a joint or fulcrum, the loose connecting bolt *g*, admitting of that slight movement; and if the point of the share is to be raised, the nuts upon the screw *i*, are turned in the opposite direction.

Fig. 6, represents another modification of the adjustable lever, and mode of attaching the share thereto. In this instance, there is a slight but unimportant variation in the form of the fore part of the frame *a*, and the lever *b*, is made with two chaps at its end, which hold the share. This lever moves upon a fulcrum-pin instead of the ridge *f*, formerly described, but is adjusted by nuts, on a screw *i*, working against an ear *k*, as before explained.

Fig. 7, represents the last-mentioned lever detached, and partly in perspective. Fig. 8, is a similar representa-

tion of the upper chap. Fig. 9, is the pad or fore-shoe, to be appended to the under part of the nose of the lever. Fig. 10, is the share, of a peculiar form, suited to this modification.

In putting the parts of this plough together, the lever *b*, is first attached to the frame *a*, by passing a pin or bolt *m*, through an aperture in the frame, and through the circular hole in the lever; and the screw *i*, is inserted into the ear *k*. The chap *n*, is then placed upon the nose of the lever *b*, and the bolt *m*, passed through the eye in the hinder part of the chap; and by means of a screw-nut, on the end of the bolt *m*, the frame, lever, and chap, are made fast together.

The back edge *o*, of the share *c*, is then inserted between the chap *n*, and nose of the lever *b*, and by means of a bolt and nut *p*, is kept securely between them. The pad or fore-shoe *q*, is then to be attached and made fast to the lever by a bolt and screw-nut *r*. The shoe or slade *d*, may be bolted on to the under part of the frame, in the ordinary way.

In order to give any required dip or elevation to the point of the share, the nuts, on the screw *i*, must be moved, as before described.

If it be thought desirable to adjust the plough, whilst it is progressing, a longitudinal screw-shaft may be made to extend from the front to the back of the plough, the forward end being passed through a swivelled eye or socket, at the top of the lever; and the reverse end of the shaft being supported in a bearing, fixed into the back part of the plough; the shaft can then be turned, when required, by a winch or other apparatus, within convenient reach of the ploughman.

As it will be necessary that the front part of the breast of the plough should rise and fall with the elevation or depression of the share, the fore part of the breast is secured to the lever *b*, in one instance, or to the chap *n*, of the lever *b*, in the other instance, by means of a pin or bolt, passed through a hole *t*, in the lever or chap, making it fast at the under side by a screw-nut, the back or hinder

part of the breast being attached to the frame by means of a contrivance, commonly called a way-pin or way-bar, in the ordinary manner. When the breast has been thus connected to the improved plough, its front part will rise and fall with the movements of the share, by the means already explained.

Fig. 11, is a view of a double-breast plough, as it would appear if seen from above; and fig. 12, is an elevation of the back part of the same. The double-breast is cast in one piece, and fastened to the front part of the frame, in the ordinary way; but the back parts of the breasts are attached to the way-bar *u*, *u*, by means of screw-pins and nuts *v*, *v*. The way-bar is firmly affixed to the frame of the plough, by a bolt and nut *w*, and the screw-pins *v*, *v*, are bolted to the inner surface of the breasts, at their hinder parts, near the top edges. When it is required to expand or contract the width of the hinder parts of the breasts, the nuts of the screw-pins *v*, *v*, are turned, so as to draw those parts of the breasts inwards, or force them outwards, the elasticity of the metal allowing of this contraction or expansion.—[*Inrolled in the Petty Bag Office, December*, 1841.]

Specification drawn by Messrs. Newton and Son.

To Thomas Wood, *the Younger, of Wandsworth-road, Clapham, in the county of Surrey, Gent., for improvements in paving streets, roads, bridges, squares, paths, and such like ways.*—[Sealed 7th October, 1840.]

These improvements consist in paving roads with two kinds of blocks combined, one being a section of a pyramid, having a square or elongated base, and the other a double wedge, cut from a similar base.

In Plate I., fig. 1, is a side view, in perspective, of the pyramidical block, and fig. 2. a plan of the same: the double wedge is shewn in several views; fig. 3, being an end view; fig. 4, a side view; fig. 5, a plan; and fig. 6, a view of the under side.

Fig. 7, represents a portion of a pavement, constructed of these blocks. *a*, is the pyramidical block, standing on its base; and *b*, the same block, resting upon its smaller end. The intermediate blocks are the double wedges,—*c*, indicating those that stand upon their bases, and *d*, those which rest upon their opposite ends. To increase the solidity of the road, the blocks *b*, are left slightly elevated above the rest, when the pavement is being laid; and when it is finished, they are rammed down to the same level as the others.

The modifications of this arrangement, described in the specification, are three in number:—the first consists in making the blocks *b*, half an inch higher than the rest, so that a firmer foot-hold for horses is obtained, and the traffic, by forcing these blocks down, consolidates the road; the second has for. its object, to take the pressure off those blocks that support the adjoining ones, and consists in making the blocks *a*, shorter than the rest; the third modification consists in making every alternate series (or rather each series *b*, *d*,) of blocks higher than the others, for the purpose of presenting a secure foot-hold for horses, and causing the pressure to act on those blocks that have their larger ends upwards.

The patentee does not claim the two forms of blocks above described, but he claims the peculiar combination, construction, or arrangement of blocks of those forms, and likewise the modifications of that combination.—[*Inrolled in the Inrolment Office, April,* 1841.]

To Osborne Reynolds, *of Belfast, Ireland, clerk, for improvements in paving streets, roads, and ways.*—[Sealed 27th April, 1841.]

These improvements consist, firstly, in forming the surface of the road of wooden planks or beams, arranged longitudinally, or parallel to the direction in which the road extends.

In Plate I., fig. 1, is a plan of this construction of pavement. *a, a,* are the planks, connected together by small iron staples, and studded with nails, to prevent horses from slipping; the planks are secured upon, and supported by, the transverse bearers *b, b,* which rest upon any suitable foundation.

Under this improvement, the patentee claims the application of planks of wood, arranged longitudinally, for the construction of a roadway.

Fig. 2, is a plan of a foundation for roads and ways, which may also be employed as a surface for the same. It consists of transverse planks or beams *c, c,* fastened upon longitudinal bearers *d, d.*

The third improvement relates also to foundations for roads, and consists of plates of iron *e,* (see fig. 3,) curved, or dished in the middle, and supported by a framing of iron or wooden beams *f.*

With respect to these two improvements, the patentee claims the construction of the foundations of a roadway, in the manner described.

The fourth improvement consists in making the surface of the road of small pieces of stone, cemented into masses, of a suitable size, by concrete or asphalte; or else of cane, bamboo, or pieces of other kinds of wood, compressed together, with their fibres in a vertical or inclined position, or cemented into masses, by concrete or asphalte.

Under this improvement, the patentee claims the construction of the surfaces of roads by the compositions, hereinbefore described, of broken stone, fibres of wood, concrete, and asphalte.

The fifth improvement is to prevent horses or other animals from slipping, and consists in inserting in each of the blocks, now used for paving, a plug or block of any suitable hard substance, as shewn at *g,* fig. 4, the upper surface of the block being slightly dished.

The sixth improvements consists in cutting the trunks of trees into short lengths, and then using them for paving, placing them side by side, in a vertical position, and filling

the interstices between them with the compound masses before mentioned.

The seventh improvement is shewn in fig. 5, which is a plan of part of a pavement. It consists in connecting the blocks *h, h,* together, by means of the dowels *i, i,* inserted into slanting grooves *j, j,* in each block.

Under this last improvement, the patentee claims the use of dowels or tenons, inserted in the contiguous blocks, as described.—[*Inrolled in the Inrolment Office, October,* 1841.]

To WILLIAM HENRY MORTIMER, *of Frith-street, Soho, in the county of Middlesex, Gent., for improvements in covering ways and surfaces, and in constructing arches.* —[Sealed 16th November, 1841.]

A NEW form of block, for paving, and for making arches, constitutes the subject of this invention.

In Plate I., fig. 1, is an end view of the block, the sides of which are cut into the inclined surfaces *a,* and *b*; a tongue *c,* being formed on one side, and a groove *d,* in the other side of the block.

The mode of employing these blocks for paving, and for forming arches, is shewn in figs. 2 and 3, the tongue of each block being inserted into the groove of the next.

This form of block may be made of wood, or any other suitable material; and the shape and position of the tongue and groove, as well as the angle at which the surfaces *a,* and *b,* are cut, may be varied.

The patentee claims the mode of constructing blocks for covering roads and ways, by combining the inclined surfaces *a,* and *b,* with a tongue, and forming, on the opposite sides of the blocks, inclined surfaces and grooves, as above described.—[*Inrolled in the Inrolment Office, May,* 1842.]

To Richard Gurney, *of Trewinnion House, in the county of Cornwall, Esq., for a method of cutting wood, and incrustating the same, in order to present a sure footing for horses and other purposes.*—[Sealed 25th November, 1841.]

This invention consists in a mode of paving with wood, and in forming blocks for that purpose, which are stated by the patentee to possess the following advantages over the other methods now in use. Firstly, greater durability; secondly, a firmer foothold for horses and other animals will be obtained; and thirdly, the entrance of water into the spaces between the blocks will be prevented.

The blocks are formed out of beams, as shewn in Plate I., at fig. 1, by making oblique cuts, in the direction of the dotted line *a*, or at any other suitable degree of obliquity, and thus producing the block, seen in the plan, fig. 2.

Fig. 3, represents a plan of part of a pavement, formed of these blocks, in which it will be seen, that from their peculiar form, the end *b*, of each block, is supported by the hind ends *c*, of two blocks in the preceding row, and that the hind end of the former block supports the front ends of two blocks in the next succeeding row. The blocks are cemented together by a mixture of black lead and gas tar, with which the front sides and bottom of each block are coated; they are then laid down in the manner shewn in fig. 3; the sides that have received the mixture, coming in contact with the uncoated sides of the blocks of the preceding row, and imparting to them a portion of the mixture. Five sides of each block are thus coated, and if preferred, in order to present a sure foothold for horses, the upper surfaces of the blocks may be incrusted or coated with a composition, formed of asphalte and bitumen, and a little sand, which is forced into the blocks by means of rollers, or by beating it with mallets, the blocks having been previously prepared by steaming to receive it.

The patentee claims, firstly, the cut of wood blocks, above set forth, for paving purposes*.

Secondly.—The incrustation of five sides, as above set forth.

Thirdly.—The right of employing the peculiar cut of blocks of wood, combined with incrustation, as above explained, for wood pavements.—[*Inrolled in the Inrolment Office, May,* 1842.]

To Herbert Read Williams, *of the city of Gloucester, surgeon, for improvements in trusses and surgical bandages.*—[Sealed 21st February, 1839.]

In Plate II., fig. 1, is a front view of an improved truss, with centre regulating plate, loops, and swivels. *a, a,* is the pad-plate, made of thin metal, elliptically arched on its upper side, its edge being turned down about one-eighth of an inch to receive the pad; *b, b,* is the centre regulating-plate, carrying the pivots or studs *c, c,* on which the metal loops *d, d,* swivel; and to these loops, the ends *e, e,* of the belt, which passes round the body, are attached. The regulating plate has an octagonal opening in its centre, which fits on the oblong head of a projection called the plinth, (riveted on the top of the pad-plate,) and is secured by the screw *f,* the octagonal form of the opening in the regulating-plate, rendering the pad capable of being adjusted to any required inclination on the square head of the plinth. *g, g,* is a metal loop, that slides on the top of the screw *f,* and to it the perineum-strap *h,* is attached, by which the pad is held in its place, the other end of the strap being passed round the thigh, and attached to the belt on either side of the hip. A single or double elliptic spring may be placed between the regulating-plate and the pad-plate, to equalize the pressure.

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* For this form of block, Mr. Harvey previously obtained a patent.—See Vol. XVIII., p. 11, of our present Series.

Fig. 2, is a military prophylactic belt, convertible into a double or single truss. *i, i,* are portions of the belt, with regulating-plate *b, b,* and loops *d, d,* attached by a plinth and screw to the pad *j, j;*—*k, k,* are the prophylactic plates, padded and lined with silk, and secured to the belt by the screws *l, l.* The belt can, at any time, be converted into a single or double truss, by inserting a truss-pad, with or without springs, under the plates *k, k,* and securing it by a screw.

Fig. 3, is a front view of an abdominal shield. *m, m,* are two thin springs, curved inwards to the proper form of the abdomen, and riveted to the surface of the shield *n, n,* which is padded tightly, and lined with silk or other soft material. *o, o,* is an elliptic spring, secured across the shield by the studs *p, p;* to which spring the regulating-plate and belt are attached by the plinth *q.* A pad may be inserted under either or both of the points *r, r,* and worn with the usual thigh-strap.

Fig. 4, is a front view of a gentleman's hunting-belt. This belt passes over the abdomen, round each hip to the back, and the ends being inserted through loops or rings on a back-pad, are brought forward and fastened by the buckles *s, s.*—*t, t,* are two thin springs, stitched into the substance of the belt, and curved inwards to the form of the abdomen. If required as a truss, pads are placed under the points *u, u,* and secured by screws.

A suspensary belt for ladies, is shewn in the specification, constructed in a similar manner to the gentleman's hunting-belt.

Fig. 5, is a front view of a utero-abdominal shield. *v, v,* are two springs, fastened on the shield *w, w,* and curved inwards to the required form; *x, x,* is an elliptical spring, by which the pressure on the abdomen is equalized, the regulating-plate, loops, and belt, being fastened on the plinth *y;*—*z,* is the perineum-spring, made of plated metal, which carries, at its extremity, the pad *a,* and is secured on the shield by the screw *b.* This screw can be passed through any of the three holes in the upper part of the spring, in order to adjust its height.

In the upper part of the spring *z*, is a hinge *c*, which allows the lower part to be drawn forward when required, the lower part being secured, when the spring has been adjusted, by means of the turning-nut *d*, passing through a slot in the spring. A perineum-strap may be used instead of the spring *z*, if preferred; the ends of the strap, in that case, after passing through rings on a back-pad, being fastened on the studs or buttons *e*, *e*.

The patentee claims the modes of constructing and applying the various parts of the apparatus to pads, and the means by which the straps or bandages are connected thereto; also the modes of arranging the different constructions of shields shewn in the drawings, and the means of attaching the straps or bandages thereto.—[*Inrolled in the Inrolment Office, August,* 1839.]

To HENRY NEEDHAM SCROPE SHRAPNEL, *of Gosport, in the county of Hants, Gent., for improvements in corkscrews.*—[Sealed 26th September, 1839.]

THE first part of this invention consists in the peculiar construction of corkscrew, shewn in Plate II. *a*, is the framing of the corkscrew, the lower part of which is provided with the pieces of leather *b*, *b*, to secure the neck of the bottle more firmly, and to prevent any accident happening to the hands of the person who is drawing the cork, in the event of the bottle bursting. *c*, is the ordinary worm of the corkscrew, having on the upper part of it the screw *d*, which passes through a female screw, in the lower part of the handle *e*, and terminates in a square head, which enters a recess in the handle, when the latter is in its closed position, as shewn in the drawing. The upper part of the handle *e*, is attached to the lower part by the hinge *f*, in order that it may be thrown back, and thus offer a greater leverage for turning the corkscrew.

To extract a cork with this instrument, the mode of proceeding is as follows:—The corkscrew being placed over

the bottle, the worm *c*, is inserted into the cork, by turning the handle *e*, the upper part of which is then thrown back, and turned round in the same direction as before, by means of the stud or projection *g*,—thus causing the screw *d*, to rise, and draw the cork out of the bottle.

The second improvement consists in the application of spikes to the under-side of the plate, which, in many constructions of corkscrews, rests upon the neck of the bottle, when the worm of the corkscrew has entered the cork.

The plate, in this instance, is allowed to turn freely on the stem of the corkscrew, and is enclosed in a small cap, fixed firmly on the stem. On the inside of the upper part of this cap, a series of inclined notches is formed.—The spikes are forced into the cork by the descent of the cap, caused by the entrance of the worm of the corkscrew into the cork; and when nearly the whole of the worm is inserted, a small bolt, which projects through the plate, is forced, by the near approach of the plate to the cork, into contact with one of the inclined notches, and thus the plate and cap are locked together. The cork being now forced round, by the continued turning of the corkscrew, will be loosened, and can be readily withdrawn from the bottle; its withdrawal will be facilitated, if the neck of the bottle is made with a female screw formed therein.

The patentee claims, Firstly.—The mode, herein described, of applying the handle *e*, and the screw *d*.

Secondly.—The mode of applying the spikes to corkscrews, herein described.—[*Inrolled in the Inrolment Office, March*, 1840.]

To Joseph Crosfield, *of Warrington, in the county of Lancaster, soap manufacturer, for certain improvements in the manufacture of plate glass.*—[Sealed 25th March, 1840.]

These improvements in the manufacture of plate-glass consist, firstly, in a more economical application of fuel, for the purpose of fluxing the raw materials, or cullet, of which

it is composed; this is effected by performing such operation in a reverberatory furnace, or in a furnace similar to those used for the smelting of copper or other metallic ores, or for re-melting cast-iron. The glass, as it is fluxed; is then made to flow into a clay pot, such as is commonly used for fluxing glass.

The reverberatory furnaces may be used in connection with the ordinary glass-house furnaces, or may be constructed so as to have a separate furnace for each pot; and this method of fluxing the materials may be applied either to a fixed or moveable melting pot.

Secondly.—With reference to those machines which are commonly employed for grinding plate-glass, the improvements consist in placing four grinding benches or stones, at right angles to each other, the rummers or upper frames of which are all put into motion at the same time, by one crank moving the fly-frame, instead of having two grinding benches or stones, placed opposite to each other, as has hitherto been the practice; and the bottom or bed-stone is made to move upon a railway, by placing it upon wheels; the advantage thus gained, is, moving it backwards and forwards, either by manual labour or by mechanical means, and thus avoiding the necessity of changing the position of the top-frame or rummer, when glasses of a large size are to be ground.

Thirdly.—With reference to those machines which are commonly employed for polishing plate-glass, the improvements consist in adding one, two, or more additional polishing-bars to the number hitherto used on each polishing-bench or frame; but the preference is given to four, rather than more or less, as hereafter particularly described. The advantages hereby gained, are the finishing a larger quantity of glass, in the same time, than can be done with the same number of polishing-benches, having only two polishing-bars. The traverse motion being necessarily shortened, the plates of glass sooner attain the required increase of temperature, by the friction being more rapidly applied to every part.

In Plate I., fig. 1, represents a longitudinal section,

taken vertically through the melting furnace *a, a, a, a*;—*b*, representing the bridge, which separates the fire from the materials; *c*, the grate-bars; and *d*, the ash-pit. The raw material or cullet is placed upon the inclined bottom of the furnace at *e*, which, when it is fluxed, flows through the fire-clay tube *f*, into the pot *g*, also placed in and heated by the furnace; an additional fire-place, for heating the pot, is shewn at *h*.

Fig. 2, is a plan view of a grinding-machine, exhibiting the improved arrangement of the grinding-benches or beds. *a, a*, represents the fly-frame; *b, b*, elbow-cranks, in the foundation; *c, c*, elbow-cranks, in the fly-frame; *d. d*, connecting-rods, with mortices, to allow the rummers or rubbers *e, e*, which contain the top glasses, to slide in; *f, f*, stone tables, for the undermost glasses to rest on; *g, g*, centre-pins and slots, for adjusting the rummers *e, e*; and *h, h*, the hinges of the connecting links *d, d*, and the fly-frame *a, a*; the whole of which is driven by the main driving-crank at *b**.

Fig. 3, represents a side elevation of a machine, for polishing plate-glass, with the improved arrangement of the polishing-bars. The bed or main framing of the machine is shewn at *a, a*, supporting the slate-frames *b*, on which the plates of glass to be polished are laid, and to which the traverse-motion is applied as usual. *c, c*, represents one of a series of four polishing-bars, with the rubbers *d, d*, which are caused to travel to and fro, alternately, as usual, upon the rummers *e, e*, being actuated by cranks and connecting-links *f, f*, which will also be readily understood.

The patentee claims, firstly, the fluxing of the raw materials or cullet, in a reverberatory furnace, in the first instance, by the direct application of the heat upon them, without the intervention of a pot or vessel in which the materials are fluxed, without being in any way confined in its application to the particular form of furnace, shewn in the drawing; secondly, placing four grinding-benches, with their rummers all put in motion, with their fly-frame, by one driving-crank in the grinding-machine; thirdly, having

additional polishing-bars, as above described, with reference to the polishing-machine.—[*Inrolled in the Petty Bag Office, September,* 1840.]

Specification drawn by Messrs. Newton and Son.

To Henry Scott, *of Brownlow-street, Bedford-row, surgeon, for improvements in the manufacture of ink or writing fluids.*—[Sealed 31st December, 1840.]

This invention consists in a peculiar mode of making ink, by the use of nitrate of iron and gas-black.

In the first place, forty-eight pounds of logwood chips are soaked in soft water for two days, and at the end of that time are boiled, for an hour and a half, in a close cauldron, with eighty gallons of soft water; they are then taken out, and forty-eight pounds of coarsely-pulverised Aleppo galls added to the liquid, which is then boiled for an hour longer. The liquid now remains for twenty-four hours, (being stirred at intervals,) and the clear portion of it, being drawn off, is mixed with forty pounds of sulphate of iron, in the state of powder; this mixture is allowed to stand for a week, being stirred daily, and then an addition is made to it of four gallons of vinegar. After this, about seven pounds and a half of gum arabic, dissolved in a small quantity of water, are incorporated with the mixture; and when a few days have elapsed, twenty ounces of nitrate of iron are added. When the mixture has become sufficiently black, the clear liquor is drawn off, and mixed with three pastes or compositions; the first of which is made by grinding half a pound of Spanish indigo in some of the ink before mentioned; the second, by grinding three pounds of Prussian blue in distilled water; and the third, by grinding four ounces of gas-black in one ounce of nitrate of iron. The ink, thus made, is stirred daily for a week, and at the end of that time the clear liquor is drawn off, ready for use.

The proportions, herein mentioned, will make eighty gallons of ink.

The patentee claims, as his invention, the application of nitrate of iron and gas-black, when combined with other suitable materials, in the manufacture of ink.—[*Inrolled in the Inrolment Office, June,* 1841]

To JOHN SWINDELLS, *of Manchester, in the county of Lancaster, manufacturing chemist, for certain improvements in the manufacture of artificial stone, cement, stucco, and other similar compositions.*—[Sealed 6th January, 1841.]

THESE improvements consist in rendering certain residual matters, (produced in various chemical manufactories,) available for the manufacture of cement.

The materials to be used in the manufacture of the lithic or stone cement, are the residuum arising from the manufacture of the chromates and bi-chromates of potash and soda, or other chromic salts, which residuum consists of oxide of iron, silicate of alumina, lime, sulphate of lime, and some undecomposed chromate of iron. If the lime, in this residual matter, does not amount to fifty per cent., other lime is added until it contains that quantity; if the silicate of alumina, contained therein, does not amount to thirty per cent., silicate of alumina, to that amount, is added. Any of the common clays will answer the purpose. These various materials are then calcined in a furnace or kiln, similar to burning limestone for the production of lime; after which, the compound is pulverised to a fine powder, and packed in tight casks, ready for use.

To make coarse cement, commonly called Roman cement, residuum, produced in the manufacture of potash, soda, or British alkali, commonly called soda-ash, is used; this residual matter is known by the name of vat-waste, and remains after the lixiviation of the alkaline salts. It consists chiefly of lime, contained in the waste sulphurate, and carbonate of lime, with various preparations of carbonaceous matters. To this residuum, silicate of alumina or any other common

clay, is added, in the proportion before stated; namely, thirty per cent. of the silicate, to as much vat-waste as contains fifty per cent. of lime; and to this is added twenty per cent. of oxide of iron, or the same quantity of oxide of manganese and iron, the oxide of iron being obtained from the residual matter, produced in making sulphuric acid from the bi-sulphurate of iron, commonly called pyrites or mundic. The oxide of manganese is obtained from the residual salts of manganese, produced in the manufacture of chloride of lime or other chlorine salts.

The method pursued in manufacturing the cement from these materials, is thoroughly to mix them together in the proportions already stated,—then to calcine them in the same way as the burning of lime, and when cold to pulverise the compound into a fine powder, and pack up the same into tight casks, ready for use.

The patentee claims, firstly, the use of the residuum, produced in the manufacture of chromic salts, for the manufacture of lithic or stone cement, or artificial stone; secondly, the use of the residual matters, produced in the manufacture of potash, soda, British alkali, or soda-ash, commonly called vat-waste, and the residual oxide of iron, produced in the manufacture of sulphuric acid from the bi-sulphurets of iron, commonly called pyrites or mundic; and thirdly, the use of the residual oxides of manganese, produced in the manufacture of chloride of lime or other chlorine salts, for the purpose of manufacturing stucco or Roman cement.—[*Inrolled in the Petty Bag Office, July*, 1841.]

Specification drawn by Messrs. Newton and Son.

To HENRY KIRK, *of Tavistock-square, in the county of Middlesex, Gent., for a substitute for ice for skating and sliding purposes.*—[Sealed 2nd November, 1841.]

THIS invention consists in the production of a composition, having a smooth surface, similar to ice, over which persons may skate and slide, at any season.

The artificial ice is cast or formed into slabs, and then laid down upon a floor, under cover; a portion of the same substance, of which the slabs are composed, being melted and used for cementing them together; or the artificial ice may be cast upon the floor, being poured thereon in a melted state. The floor must be perfectly air-tight, and impervious to the wet, which can be effected by covering it with thin plates of zinc or lead; or it may be made of stone, concrete, or asphalte.

The ingredients, that compose the artificial ice, belong chiefly to that class of chemical substances called salts, being chosen from among those salts that contain the largest proportion of water of crystallization, and which are therefore capable of being dissolved, by the method called watery fusion. The salts preferred, on account of their cheapness, are alum and the carbonate, sub-carbonate, and sulphate of soda; another substance, used in one mode of preparing the artificial ice, is sulphur.

The mode of operation, when alum is used for producing the artificial ice, is as follows:—

Ten pounds of crystallized alum is crushed into powder, and melted in a copper, and when in a liquid state, three-quarters of an ounce of sulphate of copper are added, for the purpose of colouring it; an addition is also made of one pound of hog's lard, to render it more slippery. This mixture, after it has cooled a little, is ready to be cast into slabs.

When the carbonate or sub-carbonate of soda is used, ten pounds of either of them, in the state of crystals, are reduced to a coarse powder, and melted; the action of the heat being continued, until, by the gradual evaporation of water from the melted salt, it has lost one-fifth of its weight. Three-quarters of an ounce of sulphate of copper, or a small quantity of "chemic blue," may now be added to the melted salt, to give it a colour; and the mixture, after being allowed to cool, is formed into slabs.

Sulphate of soda is converted into artificial ice, in the same manner as the carbonate or sub-carbonate of soda.

The same operation is performed when the artificial ice

is composed of a mixture of the carbonate or sub-carbonate and the sulphate of soda; equal quantities of both salts being used.

Two modes of producing artificial ice, from the carbonate or sub-carbonate of soda, by treating it with sulphuric acid, are also described.

When sulphur is used, ten pounds of it are melted, by the application of heat, and then poured into moulds, across which a number of wooden laths are placed, so that when the sulphur hardens, the laths, being embedded in it, will strengthen the slab. Laths are also used, in the same manner, when forming alum into slabs. If preferred, the sulphur, instead of being poured into moulds, may be cast in its intended place on the floor.

The slipperiness of these substitutes for ice is increased, by rubbing a small quantity of powdered French chalk over them.

A substitute for ice, for sliding upon with shoes, the soles of which are studded with nails, having round convex heads, is formed by laying plates of zinc, iron, or steel, highly polished, along a track or pathway.

The surfaces of these substitutes for ice may be either horizontal, or inclined to the horizon, and they may also be made slightly concave.

The patentee claims, the substitute for ice for skating and sliding purposes, as herein described, to be laid in an extended continuous even surface, which may be a horizontal surface, an inclined surface, or a curved surface; and which substitute for ice may be made in the manner described.—[*Inrolled in the Inrolment Office, May*, 1842.]

To EDWARD EMANUEL PERKINS, *of Westow Hill, Norwood, in the county of Surrey, Gent., for improvements in the manufacture of soap.*—[Sealed 21st September, 1841.]

THIS invention consists in obtaining products from the refuse soap-suds produced in the manufacture of silk, wool,

cotton, and linen, or from other sources where soap is used, and applying such products to the manufacture of soap.

The refuse soap-suds, resulting from the manufacturing and dyeing of woollen goods, are run into an open cask; and when the fatty, oily, and soapy matters, are precipitated, the supernatant liquor is drawn off; the precipitated matters are then drawn off to within half an inch of the bottom of the cask; and to every ten gallons, two gallons of lime-water are added (the precipitate being well stirred whilst the lime-water is poured in) to disengage the ammonia generally contained in those matters. After this mixture has remained undisturbed for about an hour, it is strained through a stout calico sieve, for four or five hours, and the matters that remain upon the sieve are put into an open vessel, and dressed down with caustic soda lees, of from 19° to 20°, specific gravity of Beaume's hydrometer, in the proportions of a pint and a half or two pints of the lees to each gallon of precipitated matter. The mixture or composition thus produced, may be used, instead of soap, for scouring, one gallon of it being equal, in effect, to a pound and a half or two pounds of the soap usually employed for those purposes.

The refuse soap-suds, produced in manufacturing and dyeing cotton and linen, are treated in the way just described, the extraneous matters (inconvertible into soap) contained in them being separated by placing a horse-hair sieve at the top of the cask into which they are run.

The refuse soap-suds, arising from the dyeing of silk, are treated in nearly the same manner as those before mentioned, the only difference being, that after the supernatant liquor is drawn off, the precipitated matters are stirred up with half their quantity of clear water, which is drawn off when they again subside, and afterwards the process proceeds, as before mentioned. But as the refuse soap-suds, resulting from the dyeing of white gum silk, will not precipitate readily, as much alum water is added to them, whilst they are running into the cask, as will separate the organic substances from the water; and after the suds have remained for three or four hours, they are strained through

calico, and treated as above described. The precipitation of the other soap-suds may also be accelerated by this means.

To make a hard soap, say, for instance, a resin soap, the precipitated matters are (after being passed through the calico sieve) mixed with caustic soda lees, in the proportions of from one to two pints of the lees to each gallon of the precipitate, and the mixture is melted with about one-eighth of its weight of resin; it is then brought to strength by the addition of caustic soda lees, and afterwards finished in the ordinary manner. The quality of this soap may be improved, by mixing with the precipitated matters tallow, fat, or oil, either with or without resin.

To make soft soap of commerce, from the products of soap-suds, the patentee proceeds in the same manner as when making hard soap, using potash lees, instead of soda lees, to the different fats and oils employed, and finishes in the ordinary way of making soft soap.

The supernatant liquor, separated from the refuse soap-suds, produced in the manufacture of silk, may (after being semi-solidified, and deprived of its colour and fetid smell) be used in the manufacture of soap, candles, or wax.

The patentee claims the mode of manufacturing soap from soap-suds, by means of obtaining precipitated and strained matters from soap-suds, and converting them into soap, as described.—[*Inrolled in the Inrolment Office, March,* 1842.]

To HENRY BROWN, *of Codnor Park Iron Works, in the county of Derby, iron manufacturer, for improvements in the manufacture of steel.*—[Sealed 22nd April, 1841.]

THESE improvements consist in manufacturing iron into steel, by first reducing the crude, pig, or refined metal, into a dry granulated state, by the operation of puddling, and passing it, when cold, through a sieve, the meshes of which are about twenty per inch. It is then cemented in an ordinary cementing furnace, for which purpose a number of

wooden frames are used; these frames are about a quarter of an inch thick and an inch deep, divided by wooden partitions, at distances of ten or twelve inches, and made an inch or two less in length and breadth than the cementing pots.

The mode of cementing the iron is as follows:—Upon the bottom of each cementing pot, a layer of pulverized charcoal, half an inch deep, is spread, and covered with paper, upon which is laid one of the wooden frames abovementioned, with its compartments filled with granulated iron, and covered with paper. On this paper another layer of charcoal, half an inch deep, is spread, and covered with paper, over which another frame, filled with granulated iron, and covered with paper, is laid, and so on continually, until the pot is full, a layer of charcoal, three or four inches deep, being spread over the top paper. The pots are then closely covered with loam, to exclude the air, and the furnace is kept heated to a very high heat, for from thirty to sixty hours, after which the pots are allowed to cool. By this process, the granulated iron is formed into cakes of steel, (the size of the compartments in the frames,) which are afterwards broken into pieces and melted in crucibles, as usual.

The patentee claims the mode of manufacturing steel, by reducing iron to a granulated state, by the means described, and submitting the same to cementation by carbon. —[*Inrolled in the Inrolment Office, October*, 1841.]

To Lancelot Powel, *of Clydach Works, Brecon, ironmaster, and* Robert Ellis, *of Clydach Works, aforesaid, agent, for certain improvements in the manufacture of iron.*—[Sealed 24th April, 1841.]

These improvements are for the purpose of rendering iron malleable, and consist, firstly, in boiling iron in a boiling furnace, (into which it is conveyed in a red-hot state from the blast furnace,) in addition to the ordinary puddling operations.

The furnace is constructed in a similar manner to the ordinary puddling furnace, except that the floss-bridge or altar, instead of being two or three inches in height, is in this twelve inches; thus the iron, when boiling and fermenting, is prevented from boiling over the bridge, and the scoria, in place of discharging itself over it, as usual, is drawn off through an opening, near the bottom of the furnace.

Secondly:—In causing a stream or streams of blast or atmospheric air to impinge upon and pass over the iron, whilst boiling and fermenting in the boiling furnace, for the purpose of purifying it, and rendering it malleable, and for correcting the "red short" quality, to which iron, that has not undergone the process of refining, is liable.

The patentees claim, Firstly:—The manufacture of malleable iron, by subjecting the iron to the operation of boiling, in addition to that of puddling and fermentation; which iron is conveyed, in a molten or red-hot state, immediately from the blast furnace to a boiling or reverberatory furnace, of the particular description or construction above mentioned, or of any other suitable construction; also by subjecting the iron, in the boiling furnace, to the action of blast or atmospheric air, as described.

Secondly:—The passing or driving a stream or streams of blast or atmospheric air, upon and over the surface of the metal, for the purpose of assisting in the purification of the same, and rendering it malleable, whilst under the operation of boiling, puddling, or fermenting, in a reverberatory furnace, of any description or construction, but under no other circumstances whatsoever.—[*Inrolled in the Inrolment Office, October*, 1841.]

To James Gregory, *coal-merchant, and* William Green, *turner, both of West Bromwich, in the county of Stafford, for certain improvements in the manufacture of iron and steel*.—[Sealed 14th May, 1841.]

The first part of these improvements relates to the manu-

facture of iron, and consists in making it softer, tougher, and of a closer texture, or of the kind called brittle iron; the second part of the improvements consist in manufacturing steel from iron that has been operated on according to these improvements.

To make the iron softer and tougher, it is immersed in water in its crude or cast state, either in the form of pigs, or in smaller pieces, and is allowed to remain in the water until an oily looking scum rises to the surface; the operation is then finished.

To give the iron, thus operated on, a close texture, it is made red hot, and either plunged into cold water, or else water is poured upon it. Instead of this, the iron may be melted in a reverberatory furnace, and poured through the perforated bottom of a vessel, into another vessel, containing cold water; the holes, through which the metal passes, being about a quarter of an inch in diameter, and lined with clay.

The patentees claim, Firstly:—Improving the quality of cast or pig-iron, by subjecting it to the action of water, either hot or cold, the iron, at the time of exposing it to the action of the water, being either hot or cold.

Secondly:—Improving the quality of iron, by pouring it, while in a melted state, into water, in the manner above described.—[*Inrolled in the Inrolment Office, November,* 1841.]

To CHARLES BUNT DYER, *of Pary's-Mine, Anglesea, mine-agent, for an improved method of obtaining paints or pigments, by the combination of mineral solutions and other substances.*—[Sealed 16th March, 1841.]

THIS invention consists in treating the waters, that flow from copper, tin, and coal mines, or are drained from the waste or refuse heaps of ore, exposed to the atmosphere and rain, or that used for washing copper and tin ores, in order to produce paints or pigments.

These waters hold in solution the oxide of iron, and the

sulphates of iron, copper, and zinc, and by the addition of a mixture of quick-lime and water, about the consistency of white-wash, or a solution of any other calcareous substance, produce a yellowish-coloured precipitate, which may be used as a paint in its original state, or converted, by calcination, into a paint of any of the different colours or shades of colour, capable of being produced by that process.

The lime and water is added to the mineral waters, in the proportions of one part lime and water to three parts mineral waters.

The patentee claims the method of obtaining a yellowish-coloured paint or pigment, convertible, by calcination, into paints or pigments of other colours or shades of colour, by the combination of any mineral water, holding in solution either sulphate or oxide of iron, or sulphate of copper or zinc, or any two or more of those substances, with a mixture of quick-lime and water, or any other calcareous substance.—[*Inrolled in the Inrolment Office, September,* 1841.]

DESCRIPTIONS OF PATENTS GRANTED IN 1834, WHICH HAVE NOT BEEN REPORTED IN THIS JOURNAL.

(Continued from page 456, Vol. XX.)

To Edward Massey, Sen., *of King-street, Clerkenwell, in the county of Middlesex, watch-maker, for certain improvements in the apparatus used for measuring the progress of vessels through the water, and for taking soundings at sea.*—[Sealed 9th December, 1834.]

The first part of these improvements relates to the apparatus used for measuring the progress of vessels through the water.

In Plate III., fig. 1, represents the stern-post and part of the stern of a vessel; fig. 2, is a transverse section of the grooved plate, shewn at *a*, in fig. 1, which is firmly bolted to the stern-post; and fig. 3, is a side view of what the patentee terms the keel-box. This keel-box *b*, which is capable of sliding up and down in the groove-plate *a*, contains the endless screw *c*, connected by the swivel-link *d*, to the link-rods or air-tight tubes of

the rotator *e*. These rods or tubes are connected together by pieces of rope, lashed to their ends, which are swelled to prevent them from drawing out of the rope. The endless screw *c*, (receiving motion from the rotator *e*, which is calculated to make eight hundred and eighty-two revolutions per mile,) drives the cog-wheel *f*, in the keel-box, and by means of a small endless screw, on the same shaft as the wheel *f*, communicates motion to a pinion on the lower end of the upright shaft *g*. The upper end of this shaft is squared, and enters a square hole in the lower end of the slide *h*, sufficient vertical play being allowed it, by means of the slot and stud at *i*.

The slide *h*, is connected with the index and register on deck, by means of a number of brass rods *j*, about twelve inches long, the ends of which are formed into eyes, and secured in brass connecting-pieces, by riveting. The upper rod terminates in a disc *p*, fig. 4, under which is a brass collar, carrying the axes of the friction-rollers *o*; these rollers travel on the bottom of the horizontal box that contains the indices, and support the rods *j*.

Fig. 5, is the index or register-box, containing a dial-plate, on which are four indices *k*, *l*, *m*, *n*, connected together, beneath the plate, by wheels and pinions. Motion is communicated to the index *k*, by a pin *q*, projecting from the disc *p*, which carries round a lever attached to the lower end of the axis of the index *k*, and shews on the dial the rate of the ship's sailing. This index makes one revolution whilst the ship is passing one-sixth of a nautical mile, and the circle being divided into ten equal parts, the number of divisions over which the index passes in a minute, will be the number of miles per hour the ship is sailing. *l*, is the second index, which completes one revolution when the ship has sailed one nautical mile; it receives motion through a pinion of seven leaves on the axis of the index *k*, taking into a wheel of forty-two teeth on its own axis. This circle is divided into six parts, and when the index *l*, has moved one of these divisions, it is equal to a complete revolution of the index *k*.

The index *l*, has a pinion of six leaves on its axis, taking into a wheel of sixty teeth on the axis of the third index *m*, which makes one revolution whilst the ship is sailing ten nautical miles; this circle being divided into ten divisions, the movement of the index from one division to another, is equal to a complete revolution of the index *l*.—*n*, is the fourth index, which makes one revolution during the time the ship is passing one hundred miles, receiving motion by means of a wheel of sixty teeth on its axis, driven by a pinion of six leaves on the axis of the index *m*; the circle is divided into ten, each division indicating a distance equal to a complete revolution of the index *m*.

Fig. 6, represents the improved mode of connecting the towing-line or rods to the towing point of the register now in use; it consists in placing a spring *t*, over the hook of the towing point,

so that the swivel at the end of the towing-line cannot be disengaged from the hook, or attached to it, without raising the spring *t*.

Fig. 7, is a plan, and fig. 8, a side view of the improved form of rotator, the core or centre being of wood, of the form of an inverted pyramid.

The second improvement, which relates to the instrument for taking soundings at sea, is shewn at figs. 9 and 10.

Fig. 9, is the sounding apparatus; *a*, is the lead weight; *b*, a strong sheet of brass, to which a box *c*, containing an endless screw, is fastened. This screw is attached to the rotator *d*, by a link-rod and swivel-joint, and works into a toothed-wheel *e*, which acts upon the register and index at *f*;—*g*, is a narrow cover or lid, turning on a hinge at *h*, being pressed against by a small click *i*. This lid, when the sounding-lead is descending through the water, is kept up, as shewn in the drawing, and the rotator is in a perpendicular position, the endless screw, in the box *c*, turning freely with it; but the moment the lead is being drawn up to the vessel again, the action of the water, assisted by the click *i*, throws down the lid into the position shewn by dotted lines, the rotator at the same time also taking the position shewn by dotted lines, and the click *i*, keeping the cover from rising, prevents the endless screw from acting on the toothed-wheel *e*, and protects it from injury when drawing up. The endless screw may be removed from the box *c*, (which is open in front,) by unscrewing the bottom adjusting-screw upon which it rests, thereby lowering it, so as to allow a portion of its shaft, smaller than the other part of it, to pass out at a slot, made for that purpose, in a bar crossing the front of the box *c*.

Fig. 10, shews the improvement in the index and register. It consists in placing the figures on the brass plate *j*, instead of on the cog-wheel *k*, as usual, the index *l*, being fitted on the axis of the wheel *k*, so as to be capable of turning independently of the wheel *k*, if necessary, while it turns with it, as a matter of course, if not prevented.

The patentee claims, First:—The improved keel-box or receptacle for the cog-wheel gear, and the vertical rods and apparatus for connecting it with the register; also the index and mode of fixing the rotator, together with the air-tight tubes or rods, as described. Likewise the mode of securing the towing-point of the register now in use, and the improved form of rotator.

Second.—The new mode of fitting the index of the sounding apparatus; also the new stop or cover *g*, together with the mode of fixing and removing the endless screw, in the frame or box *c*; and the application of a swivel-joint, not being an universal joint, to the end of the said screw.—[*Inrolled in the Inrolment Office, June*, 1835.]

To William Crofts, *of New Radford, in the county of Nottingham, machine-maker, for certain improvements in certain machinery for making figured or ornamented bobbin net, or what is commonly called ornamented bobbin net lace.*—[Sealed 23rd December, 1834.]

These improvements relate partly to certain machinery for making such ornamented bobbin net lace as is figured or ornamented by small white opaque spots of accumulated thread, distributed over the transparent tissue of the net, and partly to machinery for making such ornamented bobbin net lace as is figured or ornamented by opaque patches of cloth-work, distributed over the transparent tissue of the net, the cloth-work being composed of interwoven threads, crossing alternately under and over each other, in the manner of wicker basket-work, or of woven cloth.

The first of these improvements consists in subsituting for the pointed wires, used in forming ornamental spots in bobbin net lace, (described in the specification of a patent, granted to the present patentee, February, 1833,—see Vol. XVII., p. 190, of our present Series,) small upright flattened pins or blades, called "gatherers," and in combining the same with prolonged taking-up points, which are disposed in the ordinary row of front points of lace machinery, at all those places where spots are intended to be made in the width of the net. These gatherers and prolonged points are actuated in such a manner as will enable them to catch those selected bobbin threads which are to form the spots, and take up the same in loops over the back pointed extremities of the points, so as to produce the same results as those attained by the hooks described in the specification of a patent, granted to Mr. William Sneath, December, 1831, (see Vol. IX., p. 207, of our present Series,) when acting alone, or by pointed wires, acting in concert therewith, according to the present patentee's aforesaid improvements.

The row of gatherers being put down in lieu of pointed wires and hooks, between and amongst those bobbin threads which are intended to be curled up, are then racked, so as to bend these threads aside, by a somewhat similar action thereon to that of the pointed wires before-mentioned, except that no hooks, like Mr. Sneath's, are used in concert with the said gatherers; but, instead of hooks, the gatherers act in concert with the pointed extremities of the prolonged pins or points.

This action takes place whilst the front points are moving with nearly similar motions to those usually given to them for the purpose of taking up the ordinary twists and crosses of the bobbin-threads and warp-threads; that is to say,—during the operation of gathering up curls of bobbin-threads, to form spots, the front points are withdrawn from their resting places in the meshes

of the net, and tilted down, as if they were going to take up in their usual manner, except that they are drawn more forwards from the warp-threads, and let down at a greater distance therefrom, in order to leave room for the row of gatherers to be let down in front of the warp-threads, by a descending motion of the bar to which they are fixed, which is suspended and moved in the same manner as that described by Mr. Sneath, in his before-mentioned specification. And when the selected bobbin-carriages, which are to furnish thread for the spots, are coming through the warp-threads, from the back into the front combs, the gatherers descend, and insert their lower ends amongst their bobbin-threads; there will thus be a gatherer on the left-hand side of each of those bobbin-threads which are to be gathered, and by putting the gatherers a little backwards, their lower ends become inserted amongst the bobbin-threads of the back row or division, as well as those of the front row. At the same time, also, that the bobbin-threads are coming forwards, the front points are moved a short distance backwards, in order to insert the extremities of their prolonged points amongst the threads, both back and front, (without racking the warp-threads); and as the prolonged front points stand on the right-hand side of each pair of selected bobbin-threads, and the gatherers on the left-hand, each pair of those threads are therefore included between a prolonged point and a gatherer.

This situation of the parts being attained, the row of gatherers are racked to the right, and the row of front points as much to the left, by simultaneous motions, so as to bend the pairs of selected bobbin-threads which are included between them, and bring those threads in contact with the left-hand sides of the extremities of the prolonged front points. This being done, the prolonged rising points become inserted between the lower extremities of the row of gatherers, in such a position, that the gatherers will retain the bobbin-threads that are bent across those points, and prevent them from slipping off the pointed extremities therof, as they would otherwise do. The pair of bobbin-threads being thus caught by the prolonged points, with the aid of the gatherers, the front points are raised up, with a tilting motion of the front point bar, similar to their ordinary taking-up motion, only their pointed extremities do not reach back to the warp-threads or gatherers, excepting the pointed extremities of the prolonged points, which act in concert with the gatherers.

The gatherers are raised with the front points, by a corresponding motion, whereby they draw up the selected bobbin-threads, in loops, across the prolonged points, pulling off a requisite quantity of thread from each bobbin. When the front point bar has been carried up to its resting position, the extremities of its prolonged points (but of those alone) enter and pass through the spaces between the back points, at their proper

places in the row thereof; and the said extremities of the prolonged points, with the loops of thread across them, rise a very little higher than the extremities of the back points, so as to place the loops exactly in front of the pointed extremities of the back points, the gatherers having hitherto prevented the loops from slipping backwards off the extremities of the prolonged points.

A this period the selected carriages begin to swing backwards, in the usual course of their vibrating motion, and, in so doing, the threads proceeding from them (and which form the said loops) begin to draw backwards, giving an additional tendency to the loops to slip backwards off the extremities of the prolonged points, if the gatherers did not prevent the same; but when the carriages have moved a little way backwards, the gatherers are raised upwards, so as to withdraw them entirely from their lateral contact with the prolonged front points, whereupon the loops of selected bobbin-threads slip suddenly backwards from off the extremities of those prolonged points, and become transferred to, and deposited upon, the pointed extremities of those back points which are on the left-hand sides of each of the prolonged points.

When the loops are so deposited over the back points, the result will be the same as would have been attained by the action of Mr. Sneath's hooks, or by the action of pointed wires, combined with such hooks, according to the present patentee's former patent.

The subsequent portion of the operation, for completing the curls of selected bobbin-threads around the back points, and around behind their corresponding warp-threads, in order to secure the curls, is to be performed according to Mr. Sneath's mode.

Another part of these improvements consists in applying additional taking-up and knocking-out cams, for the front point-bar, with a suitable racking-wheel, to rotary spotting machinery, constructed according to the aforesaid improvements on those of Mr. Sneath. These additional cams are to actuate the front point-bar, whilst the prolonged front points are operating, as above described, in concert with the gatherers, in order to form spots; which motions differ, in some small degree, from the usual taking-up motions of the front point-bar, as before stated. The motions given by the said additional cams to the front point-bar, must be repeated at every complete vibration which the selected bobbin-carriages make, in passing from the back to the front combs, and then re-passing from the front to the back.

These repetitions being differently timed from the usual taking-up action of the front points, the ordinary cams, which actuate the front point-bar, during the making of the plain net, must be disengaged from their connection with that bar, at the instant that the operation of forming a row of spots is to commence. A new connection must, at the same instant, be made with

the additional cams, which are to become operative during the act of spotting; then, after a row of spots is completed, and the operation of making plain net is to be resumed, the connections of the front point-bar must be changed, by an instantaneous motion, from the additional cams to the ordinary ones.

Another improvement consists in ornamenting bobbin net lace, with spots, formed by accumulated interweavings of two extra threads, which are introduced into the warp, at every place where a longitudinal row of spots are required to be made in the net. These extra threads are included in the twists made by the ordinary bobbin-threads and warp-threads, so as not to shew very perceptibly in the plain net their course from one place to another, and the two extra threads which are to form each longitudinal row of spots, proceed by separate courses along the net, in order to be less visible.

The spots are formed, at the required places, by the said extra threads crossing and re-crossing each other in contrary directions, before and behind three bobbin-threads, and two intermediate warp-threads, so as to form several short zig-zag courses across five adjacent threads, and thus produce flat woven spots. The manner of performing this, on the kind of bobbin net machinery, commonly called "Lever's machinery," is represented in Plate III., at fig. 1.

The machine has its warp-threads, and main guides, as usual, and two extra guide-bars, for the extra threads, one applied in the front, and the other at the back; there being one opposite each place in the width of the net, where spots are required to be made. If the spots are to be disposed according to a chequered pattern, then two additional guide-bars *a*, *b*, in front, and two more *c*, *d*, at the back, will be requisite, the extra threads being held by their guides, in two different planes, from the main warp-threads; viz., one tier of extra threads in front, and the other tier at the back of those threads, so that the extra guides will be capable of shogging, independently thereof. The extra threads are supplied from two or four extra beams or thread-rollers *e*, *f*, one to each guide-bar; and each roller must have a suitable connection with the usual apparatus of the point-bars, either back or front, for turning the roller round, in order that it may give off the exact quantity of thread required, at each time of taking up the extra threads.

The usual taking-up points must be removed, and a new set applied, with twice as many pins in a given width, the new pins or points being thinner than usual, and cast in leads, cranked downwards from the point-bars, to which they are screwed, so as to enable the points to go down very near to the tops of the carriages in taking up. These points will take up all the twists and crosses as fast as they are made, instead of what is termed "hugging the twist," and the Lever's machine will be better adapted

for this purpose, if its comb-bars and landing-bars are spread wider apart than usual at their lower edges, which may be done by bending the arms of the main joints, by which those bars are suspended, outwards, so as to leave more space between them for the extra guide-bars.

The points being so close together, one row cannot pass through the other, as usual, in taking up, with Lever's machinery, but one row must be always over the other row, in two levels, to which each row must be raised in its turn, and therefore suitable moveable pieces are interposed between the stop-screws, for limiting the descent of the tail-poles for each point-bar, in order thereby to limit the ascent of the row of points that took up last, to the lower of the two levels, and keep its points from striking the other row of points which took up previously, and which have reached the higher level; then as soon as the latter are withdrawn from the meshes of the net, their moveable piece is also withdrawn, in order to allow the other points to go quite up to the higher level, ready for those which were withdrawn to ascend, after taking up, without one row of points touching the other row. Or this may be done by prongs, fixed to each point-bar, overlapping each other, in the manner of what are called horns, which are pieces projecting from each point-bar, exactly in the range of the row of points belonging to that bar, and overlapping each other, so as to prevent the two rows of points from coming in contact.

The usual racking-wheels of Lever's machinery, on the upright axis, at the right-hand end of the machine, are to be changed for other racking-wheels, having a ratchet-wheel, of nine teeth; to turn them; and a set of racking-wheels must be suitably formed for racking the front comb-bar, and the main guide-bar, so as to produce all the movements usually given by the bars in Lever's machines, but in nine motions, instead of eight.

The two or four extra guide-bars *a*, *b*, *c*, *d*, for the extra guides, are to be racked by additional racking-wheels, applied on an upright axis of their own, at the left-hand end of the machine, turned by a distinct chopper, which, by a driver, actuates a large ratchet-wheel of forty-five teeth, fixed on the axis, turning it round one tooth, at the same moment that the ordinary racking-wheel is turned. The driver *h*, (the wheels are not shewn in the drawing) is jointed to one arm of an elbow-lever *i*, which plays upon an upright centre-pin *j*, fixed in a bracket, projecting from the frame; the other arm of the lever *i*, is acted upon by a projection *k*, affixed to one of those links *g*, called goose-necks, which is jointed to the front landing-bar, and reaches downwards and backwards beneath the fixed tye-bar, to the lower end of the driving tackle-lever, at the back of the machine. By this means, when the landing-bars are extended, the elbow-lever *i*, is moved by the projection *k*, and the driver *h*, is made to turn the ratchet-

wheel of forty-five teeth, one tooth, a re-acting spring being applied to pull back the lever *i*, when the projection *k*, retreats from it, as the landing-bars are closed.

An additional horizontal axis is placed behind the machine, on which are fixed seven cam-wheels, for producing the changes that are required to be made in the machinery, for ceasing to make plain net, and beginning to make spots, and *vice versa*. This back axis is caused to revolve by a ratchet-wheel, of forty-five teeth, fixed thereon, which is turned round, one tooth at a time, by a driver, acting on the lower part of it. The driver is jointed to the lower end of a short arm, which projects downward from the middle part of the usual horizontal back axis of the goose-neck or drawing tackle-levers; therefore the driver is put backwards, and turns the ratchet-wheel round one tooth at every time the landing-bars are closed,—this motion being given at the same moment that the ordinary catch-bar wheels are turned round one tooth.

The racking-wheels, on the additional upright axis, and those on the back-shaft, will complete a revolution in the same time, namely,—the racking-wheels and the ratchet-wheel, with nine teeth, on the ordinary upright axis, perform three revolutions, in order to make three complete rows of meshes, which corresponds to a motion of twenty-seven teeth of the forty-five teeth of the additional racking-wheels; after which, the said ratchet-wheel of nine teeth remains stationary, during the time it would take to revolve twice more, the pause being occasioned by the ordinary chopper having being disengaged, and during this pause a row of spots is made.

The point-bars must take up continually, during the making of the spots, so as to gather up and accumulate the extra threads into spots. Those extra threads, back and front, of which a pair are required to form each spot, are racked to the right and left, in contrary directions to each other, previous to the carriages passing and re-passing between the warp-threads, whilst all the other warp-threads remain stationary; and the carriages are never divided or traversed, during the making of the spots. The points, back and front, alternately, must take up every time that the carriages are passed and re-passed, but as no twists or crosses will have been made, the points will only catch up the extra threads, whereof each pair, back and front, by the contrary racking motions, have been lain across two of the bobbin-threads, which have passed and re-passed, and also across the three warp-threads belonging to those bobbin-threads.

This mode of operating, during the making of the spots, requires that different arrangements of the parts of Lever's machinery should be made, from those by which plain net is made therein, viz., the catch-bar wheels are required to act differently, in order that the carriages may be passed and re-passed, without

interruption, for dividing; wherefore the catch-bar wheels, that are operative during the making of the plain net, must be disconnected, and others brought into action; also the pusher-bars, and dividing apparatus, must be rendered operative during the taking up.

For the purpose of bringing all these parts into operation, the following cams are provided:—on the right-hand extremity of the back axis is a cam, having a prominent rim on one side of its circumference, which rim is cut so as to act on the back end of a horizontal lever, and cause its other end to act against a prong fixed to the ordinary driver of the chopper, for the ratchet-wheel of nine teeth on the upright axis of the ordinary racking wheels. The rim, when in action on the lever, will hold the driver to the left, and prevent its action on the ratchet-wheel, in order to leave the same motionless; but when that part of the rim which is cut away, comes into action on the lever, then the driver is allowed to act as usual.

Another cam-wheel is fixed on the back axis, acting by its circumference on the back end of a lever, which turns at its centre on a fixed pin, and is linked at its front end to the ordinary driver for the front catch-bar wheel. When the prominent part of the circumference of the cam is acting beneath the back end of its lever, the driver will be at liberty to perform its usual functions; but when the lower part of the cam comes round, the driver will be held up, and kept out of action by the force of a spring, which pulls down the back end of the lever.

At the side of the last-mentioned cam, a similar one is fixed on the back axis, with a lever acting in the same manner on the two ordinary claws, for the small ratchet-wheel, by which the lace-roller is turned, in order to wind up the lace as it is made. Thus the lower part of the cam, acting on the lever, will cause it to hold the claws out of action, in order to suspend the winding up of the lace, whilst spots are making; but when the prominent part of the cam comes round, it leaves those claws at liberty to act in their usual manner, during the making of plain net.

A pair of additional catch-bar wheels, having ratchet-wheels of eight teeth, and mounted in a frame of the usual kind, must be applied to the landing-bars, front and back, to act, during the spotting, as substitutes for the ordinary catch-bar wheels, front and back, which are then rendered inactive; and in like manner, the two additional catch-bar wheels are rendered inactive whilst the plain net is making.

The front set of these additional catch-bar wheels, is applied to the left-hand side of the front landing-bar, at *l*, close to the hanging cheek of the bar, and the back set (not shewn in fig. 1,) is applied on the right-hand side of the back landing-bar. Their ratchet-wheels are cut with eight teeth, and are driven by extra

claws, mounted on fixed centre-pins, like the ordinary dividers. The claw for the extra front catch-bar wheels is marked *m;* the claw for the back wheels is not shewn. The common catch-bar wheels must be removed and replaced by others, suitably cut to act with ratchet-wheels of nine teeth, which must be substituted for the ordinary eight-toothed ratchet-wheels; and during the spotting, the ordinary catch-bar wheels, which then remain inactive, must both of them present notches to the prongs or riders of their catch-bars, respectively, in order that they may allow those bars to drop, by the action of the additional catch-bar wheels, which are then operative.

On the back axis at the side of the cam that communicates motion to the lace roller, is another cam, which acts in a similar manner on the back end of a lever. The front end of this lever lifts up the additional claw, by which the extra back catch-bar ratchet-wheel is turned, that claw being mounted on a centre-pin, projecting out of a fixed bracket, screwed to the back tye-bar. The prominence of the last-mentioned cam is in action on its lever all the time spotting is going on, and will then let down the said claw, so as to turn the ratchet and the extra back catch-bar wheels; but the lower portion of the cam comes into operation when plain net is to be made, and lifts the claw out of action by the force of a spring, which is applied to the back end of the lever.

Near the middle of the back axis is a cam, which acts on the back end of a horizontal sliding-bolt, at the time of spotting, and causes it to move forward the two dividing links out of their usual holes in the ends of the arms of the dividing levers. These are both fixed on a short horizontal back axis, and the holes in the ends of the arms being cut into stops to receive the pendulous links, they will become disengaged, so long as the prominence of the cam is in action on its bolt, and then the back pusher-bar *n*, will not be brought into action at the time of taking up. When the prominence of the cam passes away, the links will be carried back by the force of a re-acting spring, applied to the bolt, and re-inserted in the holes in the ends of the arms, to restore their usual connection with the dividing apparatus and back pusher-bar *n*, for making plain net. During the operation of spotting, the front pusher-bar is held forwards, so that its pushers are kept quite out of action, by means of a prominence on the usual front pusher-wheel remaining in action during the time that the front catch-bar wheels are inactive.

On the additional back axis is a cam, for actuating a back-stop *o*, for detaining the landing-bars at the proper position for taking-up in making the spots; and there is a cam-wheel and lever, to act on the back end of the usual driver for the ratchet-wheel of the ordinary back catch-bar wheels, so as to hold up

that driver out of action when the cam presents a prominence, and *vice versa.*

The claw *m*, which drives the ratchet-wheel for the extra front catch-bar wheels, is lifted out of action whilst plain net is making, by the right-hand end of a lever *p*, mounted on a fixed centre-pin; and the left-hand end is pulled down by a spring, which is thus (when it is permitted to operate) the means of holding up the claw *m*. The same end of the lever *p*, is acted on by a prominent rim, on the upper side of the uppermost wheel of the four large racking-wheels on the additional upright axis at the left-hand end of the machine, which wheels are racked simultaneously with the racking-wheels on the ordinary upright axis; and when the rim is brought round to the tail of the lever *p*, the claw *m*, is let down into operation on the extra front catch-bar wheels, suitably for making spots.

Near the ratchet-wheel of forty-five teeth, another wheel is fixed on the middle part of the back axis, acting as a substitute for the ordinary ratchet-wheel of eight teeth for the dividing stop. This is an addition to the wheel for the back-stop *o*, which is operative during the making of spots, and every time that the landing-bars are closed, this wheel causes the stop *o*, to catch the back landing-bar, and detain the bars quite closed whilst the points take up; but when the points get up, this wheel permits the tail of the stop *o*, to be lifted by a re-acting spring, so as to disengage the stop, and liberate the landing-bars. This is accomplished by giving a motion of about one-fifth of a tooth to the large ratchet-wheel on the back axis, by one or other of two nudging-drivers, which are suspended from the tail-poles of the two point-bars, as usual, so as to hang down in the way of the teeth of the ratchet-wheel.

When plain net is making, the other wheel, which is substituted for the ordinary dividing stop-wheel, performs the office of that wheel, by suitable prominences, bringing that stop (which is formed similarly to the back-stop *o*, and mounted at the side thereof, on the same fixed centre-pin) into action instantaneously, at every proper time for taking up, in order to retain the landing-bars at their proper distance asunder for dividing; but the prominences release the stop when the large ratchet-wheel is moved round by one or other of its nudging drivers, during the ascent of the point-bars, whether back or front. A spring is applied, as usual, to the back end of the tail of the dividing-stop, but reversed to its usual action, viz., it must pull up the tail, in order to unlock the stop; and it is the prominence of the cam that puts the stop in action. The spring of the back-stop *o*, is applied in like manner.

The shape of the wheel and its fellow which actuate the stop *o*, will be that of a ratchet-wheel of forty-five teeth, having

their teeth cut away at all those parts which would come into action when each stop is not required to act.

The apparatus for turning round the small thread-rollers, which supply the additional threads for forming the spots, derives its action from the going up of the point-bars, either back or front, whenever they act, during the operation of spotting. For this purpose, a ratchet-wheel *r*, is fixed on the end of each of the extra rollers *e*, *f*, being turned by a driver *q*, which is jointed to the front end of a short lever-arm, projecting forwards from a long horizontal axis *s*. From this axis, also, a longer lever-arm *t*, proceeds upwards and backwards, to reach beneath the lower ends of the two pendulous links before mentioned, in such a manner, that when either of those links ascend, during the going down of either point-bar, the driver *q*, will be caused, by a spring *u*, to descend and take a tooth of its ratchet-wheel *r*. Then, as the points go up again, after having taken the extra threads, the driver *q*, will be forced upwards, and will turn the roller *f*, so much as to unwind the required quantity of extra threads therefrom; and when the plain net is making, the pendulous links being both drawn backwards by the sliding-bolt and cam-wheel, their lever ends will no longer be over the ends of the lever *t*, and will therefore have no action thereon when the points act for taking up the meshes of plain net.

Each of the extra rollers *e*, *f*, and two others, if such are required, must be provided with its ratchet-wheel *r*, driver *q*, and axis and levers; but as only one-half of the number of those extra rollers will be required to be operative at the same time, the drivers of those which are for the time inactive, must be held off from contact with their ratchet-wheels, by a connection with suitable curved pieces, fixed to their corresponding racking-wheels.

The object of the last part of the present improvements, is to form ornamental patches of woven cloth-work, in the midst of a tissue of meshes of bobbin-net, which is composed of both traversing and longitudinal threads, so that each patch of cloth-work shall be surrounded by meshes of real net. The ornamental portions of cloth-work, formed in the bobbin net, according to these improvements, are composed, by interweaving additional weft-threads to those which compose the other parts of the net, such weft-threads passing across and across the longitudinal threads of the net, as well as across intermediate threads, which are traversing threads in the net, but assume a longitudinal direction in the cloth-work; and which threads, before arriving at, and after having passed along, the cloth-work, proceed in their contrary traversing directions, in order to form net.

This part of the improvements consists in arranging the parts and movements of bobbin-net machinery, in such manner, that the cloth-working operations may be going on with some portion

of the set of bobbin-carriages and warp-threads, without any hindrance to the performance of the ordinary twisting and crossing or traversing operations, by other portions of the same set of bobbin-carriages and warp-threads, thereby forming a proper tissue of meshes of bobbin net, at one or both sides of the places where cloth-work ornaments are to be made, as well as above and below the said places, so that the said net will form a ground for the cloth-work ornaments.

Fig. 2, represents a partial transverse vertical section of a circular-bolt single-tier inverted machine, with this improvement applied thereto, the warp-roller *a*, being at the upper part, and the lace-roller *b*, at the lower part of it. The warp-threads, proceeding downwards from the warp-roller, are threaded through the eyes of one row of guides, fixed on one guide-bar *c*, in a single row, and the bobbin-carriages are all passed between in one row, similar, in that respect, to the usual mode of working Lever's machinery, although, in other respects, this machine bears a greater resemblance to pusher machinery, the bobbin-carriages being moved backwards and forwards in their circular bolts, by the swinging action of pusher-bars *d*, *e*, in front and at back. These bars are suspended in crank bar-arms *f*, *f*, and guided in their backward and forward motions, in exactly the same manner as in pusher machines, being moved backwards and forwards with a coincident and simultaneous motion.

The two rows of pushers *g*, *g**, which are fixed to the two pusher-bars *d*, *e*, act against the upper parts of the carriages, where the same rise up above the circular combs *h*, *i*, between the intervals therein, in order to push the carriages through between the warp-threads. The pushers, like those of pusher machinery, are only half as numerous in their row as the carriages, so as to push forwards every other carriage in the row; and the back pushers *g**, are adapted to act in that manner on one division of carriages, consisting of every alternate carriage in the row, whilst the front pushers *g*, are adapted to act in like manner upon the other division, consisting of the intermediate carriages; but instead of thus passing all the carriages in two divisions, at all times, as is done in pusher machinery, they are only passed in two divisions at the time of dividing the carriages, being in that respect more similar in their operation to Lever's machinery. At other times, all the carriages are passed in one row, for which purpose front and back driving-bars *j*, *k*, are provided with blades, projecting out from the edges of those bars, and turning downwards at their edges, so as to be capable of lifting up clear above the pushers, or else to fall down opposite to the ends of the pushers, in a proper situation to act upon the carriages in lieu of those ends. In this case, the edges of the driving-bars *j*, *k*, will pass all the carriages together, in the manner of single-tier

machinery; but, in an instant, by lifting up the ends of the driving-bars, the ends of the pushers act on the carriages instead of them, and will then pass the carriages in divisions, consisting of alternate and intermediate carriages of the whole row.

The driving-bars *j*, *k*, are affixed by arms *l*, *l*, to spindle-bars *m*, *m*, which are mounted on pivots, at each end, in bearing-pieces *n*, *n*, affixed to the pusher-bars *d*, *e*, near each end thereof; and from the spindle-bars *m*, *m*, short lever-arms *o*, *o*, extend outwards, their extremities acting upon notched wheels *p*, *p*, which are fixed in a row, on horizontal spindles *q*, *q*, supported by small brackets, projecting from the outer faces of the pusher-bars *d*, *e*. Ratchet-wheels *r*, *r*, are fixed on the axes *q*, *q*, to turn them, and the notched wheels *p*, *p*, one tooth every time that the pusher-bars, with the crank-bars *f*, *f*, swing outwards, to the full extent of their vibration from their warp-threads; so that the front wheels *q*, *r*, will be turned, when the pusher-bars swing out forwards, and the back wheels, when they swing out backwards, by means of the drivers *r**, *r**. The notched wheels *q*, *q*, are cut with such notches on their circumferences as will, by acting on the levers *o*, *o*, let down the blades of the drawing-bars *j*, *k*, beyond the ends of the pushers, to act on the carriages; or will raise up those blades above the ends of the pushers, and quite clear of the carriages, so as to miss the same, leaving the pushers *g*, *g**, free to operate thereon.

The rows of pushers *g*, *g**, are not quite regular, the pushers being cut out at particular places in their respective rows, where cloth-work is to be formed in the net, and also at the selvages of the breadths, when the net is to be made in breadths; extra pushers are provided to fill up such vacancies when necessary, or to fill up the usual intervals or regular spaces between the pushers, in some places in the front row, and render that row solid at particular parts. These extra pushers are affixed to three spindle-bars *s*, *t*, *u*, in front, and three others *v*, *w*, *x*, at the back, being all of them mounted in the same manner as the spindle-bars *m*, *m*, of the driving-bars *j*, *k*, and provided in like manner with arms *o**, *o**, *o**, *o**, *o**, *o**, to reach out to other notched wheels, fixed on the same axis as the notched wheels *p*, before mentioned, so that the succession of the notches around the wheels, determines the changes that shall be made in the two rows of pushers *g*, *g**, in order to adapt them to pass some carriages between the warp-threads, leaving others; or by letting down the driving-bars *j*, *k*, to pass all the carriages at once.

The machinery is provided with several extra guide-bars *y*, *z*, *z**, in front, and as many at the back, with extra guides fixed on those bars, at suitable places, for the performance of their intended purposes. The two lowermost extra bars *y*, *y*, back and front, are weaving-bars, for guiding the weft-threads which are to form the

cloth-work, and are racked by large extra racking-wheels, at their left-hand ends.

There will, in all cases, be two weaving-bars employed in concert, one at the back and the other in front of the warp-threads; and two pairs, as *y*, *y*, *z*, *z*, will frequently be required in the same machine,—one pair forming cloth-work, at certain parts of the net, and the other pair forming cloth-work, at other parts thereof, as the pattern may require, Another of the bars *z**, will be required for the selvage thread-guides, when breadths are to be made, the selvage-threads being actuated in a similar manner to those used in Lever's machinery; and the whipping-threads, by which the edges of the breadths are united together, are supplied from carriages, which operate in a somewhat similar manner to those in Lever's machinery. The remaining extra guide-bar *z**, might be used to guide those warp-threads which belong to the cloth-work, as before mentioned, for the purpose of retaining those threads from racking, when the cloth-work is making; but the patentee prefers to employ retainers, which are inserted between those warp-threads.

The retainers 1, are small bended wire pins, adapted to be inserted between the warp threads, close between the eyes of the guides, the bended points entering in a horizontal direction between the warp-threads, and their shanks or stems descending in a vertical position, close behind the guide-bar *c*. The stems 3, of the retainers, are thin flat blades, placed in a row, (quite detached from one another,) side by side, upon one long horizontal centre-pin or jack-wire 2, which is their common centre of motion, and they are guided between combs or sleas 4, 5, to keep them separate. The bended wires 1, which are inserted between the threads, are at the lower end of each stem; and the upper end of the stem is formed with a beak, resting against the circumference of a notched wheel 6, of which there is one to each retainer, mounted, side by side, upon a horizontal axis above the machine; by turning these wheels round, the whole of the retainers, or certain portions of them, are brought forward, so as to insert their lower ends amongst the threads.

The range of motion given to the weaving-threads, by racking their guide-bars *y*, *y*, *z*, *z*, should be such as to carry them alternately backwards and forwards across those warp-threads which are retained from racking, and consequently from twisting with the bobbin-threads, because the warp-threads that are so retained, are those that (together with their intermediate bobbin-threads) are to form the warp for the cloth-work, to which the weaving-threads form the weft; and when the weft-threads are made to pass across a greater extent, a greater number of warp-threads should be retained from racking. Those warp-threads, that are not so retained, will form twists, and become part of the tissue of the net, whilst the other warp-threads, which are retained, will become

part of the tissue of the cloth-work. This is the case generally, though particular shoots of the weft-threads may be occasionally carried out beyond the boundaries of their warp-threads, a little way into the adjacent meshes of the net, so as to form open loops at the termination of the zig-zag courses, and give effect to the pattern,

The retainers 1, are never racked, their office being simply to prevent the warp-threads, between which they are inserted, from racking, although the guides, by which the retained threads are guided, do rack; and generally, after the retainers have made their insertion between the warp-threads, at the commencement of weaving a portion of cloth-work, they continue so inserted, without any motion or alteration, until that portion of cloth-work is finished; but, during the progress of the weaving, some of them may be withdrawn, or additional ones inserted, if necessary.

The twisting of the retained warp-threads with the bobbin-thread being thus prevented, the traversing of the corresponding bottom-threads must also be prevented, which is done by causing all the bobbin carriages, that supply those threads, to remain by themselves in the back-combs, at all those times that their fellow carriages are in the front combs, for the purpose of being racked, one division to the right and the other to the left, in order that they may make steps of their progressive traversing, which steps of traversing form the crossings of the bobbin-threads over each other; but the carriages that are thus kept behind, escape or avoid the traversing action which the other carriages undergo. The bobbin-carriages that border upon those that do not traverse, but which, together with their intermediate detained warp-threads, form the warp of the cloth-work, must perform turn-again evolutions, when, by traversing across the net, they arrive in succession at the borders of each patch of cloth-work; and the lateral boundaries of the net, adjacent to the lateral boundaries of the cloth-work, must be a selvage, but engrafted into some or all of the returns of the zig-zag loops which constitute the border of the cloth-work.

The points by which the net and cloth-work are to be taken down, are made with double the number of pins usually employed in machinery of like guage, and some of those pins 7, which are situated at the places where the cloth-work is to be made in the net, instead of being cast in their places in the leads, may be formed at the ends of detached stems 8, mounted side by side, in a row, on a jack-wire or centre-pin, and being retained, at equal distances from each other, by a comb 9. Their tails or opposite extremities are formed with beaks, to bear upon the edges of a row of small notched wheels 10, fixed on an axis 11, which is supported in bearing-sockets, affixed to the point-bar; a spring 12, being applied to each stem, to urge its beak towards the wheels.

Both the rows of points, back as well as front, are furnished with such detached and moveable pins 7, which are, by means of the notched wheels, moved out of their proper range in the usual straight row of points, in order that the zig-zag courses of weft-threads which are taken up by them, instead of being confined to straight horizontal lines across the net, may be taken up according to lines slightly curved across the net, or in inclined lines; and also that the successive zig-zag courses of weft, which are taken up, may be varied in the said curvature or inclination, in consequence of such alterations as the row of notched wheels will be capable of producing in the range of the row of detached points 8, during the weaving of the cloth-work.

The axis of the notched wheels is caused to revolve by a small ratchet-wheel, fixed on it, which is turned round, a tooth at a time, by a small click 13, (mounted on a fixed stud-pin, at the upper end of a bracket screwed to the frame,) every time that the point-bar, to which the wheel belongs, is withdrawn from the threads, in preparation for taking up.

The patentee claims, Firstly.—The improvement (hereinbefore described) of applying gatherers, to act in concert with prolonged front points, for the purpose of catching up selected bobbin-threads, so as to draw the same up into loops, by the prolonged front points, with the aid of the gatherers, and transfer the said loops to the back points, for the purpose of forming spots, by repetitions of drawing up such loops by the combined action of the gatherers and prolonged front points.

Secondly.—The improvement (hereinbefore described) of forming ornamental spots in bobbin-net lace, made in Lever's machines, by accumulated inteweavings of extra threads, which are introduced into the net, and included within the twisted texture thereof, so as to be as little visible as possible in the courses by which they proceed from one spot to another.

Thirdly.—The improvements (hereinbefore described) for forming ornamental patterns of woven cloth-work, in either pieces or breadths of bobbin net lace, which is composed of longitudinal and diagonal traversing threads; the peculiar features of the improvements being the suspending the twisting and traversing of those bobbin-threads and warp-threads, which are for the time to constitute the warp of the cloth-work, by means of the detainers, whereof the insertion is governed, as hereinbefore described, by a row of notched wheels, or a barrel; also the removal and replacing of extra pushers, in the manner hereinbefore described, that removal and replacing being governed by rows of notched wheels or barrels; and the application, hereinbefore described, of detached pins, in the row of taking-up points for the cloth-work, which pins can be arranged to take up the successive courses of weft-threads of the cloth-work, in curves or oblique lines, wherof the curvature or obliquity is governed by rows of notched wheels or barrels.—[*Inrolled in the Rolls Chapel Office, June,* 1835.]

To Henry Stothert, *of the city of Bath, founder, for certain improvements in ships' hearths or cabouses.*—[Sealed 23rd December, 1834.]

This invention relates to the apparatus usually known as ships' hearths or cabouses, intended for cooking provisions, and supplying fresh water, on board of vessels at sea, in which sea-water is used for producing the steam employed in cooking the provisions.

The drawing in Plate III., represents a transverse vertical section of the improved cabouse, in which *a*, is the boiler; *b*, the fire-place; *c*, the ash-pit; and *d*, a flue, leading to the chimney *e*.

The improvements consist in dividing the space *f*, occupied by the water, from the part *g*, of the boiler, in which the cooking vessels are placed, by a metal plate or diaphragm *h*, in order to prevent the water, produced by the condensation of steam in cooking, from returning to and mixing with the water in the lower part of the boiler. On the upper side of the diaphragm a hollow chamber *i*, called the separator, is fixed, being sufficiently narrow to stand up between the cooking vessels; and in the upper part of it apertures *j*, are made for the admission of steam amongst the vessels. Through the diaphragm, at each end of the separator, and within the same, openings are made for the passage of the steam generated in the lower part of the boiler, with guards fixed at a distance from such openings, below and above the diaphragm, and with horizontal and vertical divisions within the separator, so as to prevent the sea-water, in the lower part of the boiler, (when it is agitated by the rolling of the vessel,) from passing with the steam into the upper part of the boiler.

From the upper part *g*, of the boiler, the condensed steam, or fresh water, produced by the cooling properties of the cooking, and the superfluous steam, is conveyed by a pipe *k*, into the refrigerator *l*; an inverted syphon *m*, is placed upon the pipe, so that the steam, in passing from the upper part of the boiler to the refrigerator, is compelled to resist the static pressure of about eight inches of water, deposited in the syphon, the area of which is four times larger than the pipe, to give the steam, operating upon the cooking vessels, a degree of elasticity beyond that of the atmosphere.

The refrigerator is capable of containing the whole contents of the lower part of the boiler, and is divided into two parts by a plate *n*, fixed about one quarter of its whole height from the bottom, the upper part being called the cistern, and the lower part the condenser, into which the steam and fresh water from the boiler is admitted. The cistern is filled with cold water by a feed-pipe *o*, reaching within an inch and a half of the bottom of the same; and at the top of the cistern is a cock *p*, connected

with the boiler, through which, when the cistern is filled, the water runs and fills the boiler. When the water in the cistern becomes warm, by absorbing the heat of the steam and condensed water in the condenser, through the plate *n*, and it is necessary to re-fill the cistern with cold water, to carry on the condensation, it can be admitted through the feed-pipe *o*, which, passing to the bottom of the cistern, and having greater specific gravity than the warm water contained therein, displaces that water, and forces it up through the cock into the boiler.—[*Inrolled in the Inrolment Office, June,* 23, 1835.]

To Elijah Galloway, *of Westmoreland-place, City-road, in the county of Middlesex, engineer, for certain improvements in steam-engines, which improvements are applicable to other purposes.*—[Sealed 23rd December, 1834.]

This invention relates to that description of engine called rotary, and consists in applying a peculiarly constructed piston, within a steam-chamber or barrel, of an elliptical form, in such a manner, that although the piston drives the main shaft or axis, it is not directly affixed thereto, but is capable of a sliding movement in the direction of its length over the shaft, so as at all times to touch the inner periphery of the elliptical steam-chamber, and keep the sides steam-tight. In order to effect this, the main shaft passes through the two ends or covers of the steam-chamber at a point excentric to the semi-transverse section of the ellipse, and upon the minor axis.

The drawing in Plate III., represents a transverse vertical section of an engine, constructed according to this invention. *a*, is the elliptical steam-chamber of the engine; *b*, the main shaft or axis, which passes through stuffing boxes in the covers or ends of the engine. *c*, is the piston, which is composed of two plates *d*, *d*, with recesses *e*, *e*, formed in them, to allow sufficient play for the links *f*, *f*, which are fastened by pin-joints to the inner ends of the recesses, the other ends of the links being connected to the levers *g*, *g*, fixed on the main shaft *b*. By this mode of connection, the piston will be constrained to move in such a manner, that a line drawn through it, as at *h*, will, at all times, intersect the centre of the axis *b*. *i*, *i*, *i*, *i*, are filling pieces of metal, wood, or other material; their object being to fill up the space below the piston, in order to prevent waste of steam in working the engine. The induction and eduction pipes for the steam, are inserted into one end of the engine, at the positions indicated by the dotted circles *j*, *k*.

The following is the mode of working the engine:—The piston, (which is now in the position that may be called its dead centre,)

is to be placed, by means of the fly-wheel of the engine, so as to leave open the induction pipe *j*, for the admission of the steam, which, acting on one side of the piston, will force it to rotate within the elliptical steam-chamber *a*, the fly-wheel equalizing the power transmitted to the main shaft *b*, and also carrying the piston over the dead centre, before mentioned; a continuous rotary motion will thus be given to the main shaft *b*.

The above arrangement may be varied in its minor details. These improvements can be applied to pumps, all the alteration that is necessary to be made, being to cause the induction pipe to pass into the well, or other source of supply, and the eduction pipe will become the discharging pipe. Rotary motion being then communicated to the main shaft, will drive round the piston, and cause the water to be raised and forced in a continuous stream.

The patentee claims the application of a sliding piston to a steam-chamber or engine of an elliptical form; such piston driving the main shaft or axis, although it is not directly affixed thereto, but is capable of sliding thereon, in the direction of its own length, as described.—[*Inrolled in the Inrolment Office, June*, 1835.]

To Joseph Hansom, *of Hinckley, in the county of Leicester, architect, for an improved vehicle, for the conveyance of various kinds of loads on common and other roads.*—[Sealed 23rd December, 1834.]

This invention consists in a new arrangement of parts to form more commodious vehicles for various purposes than are now in use.

In Plate III., fig. 1, is a side view of a passenger carriage, constructed according to this invention. The wheels of this are much larger than usual, and turn upon short spindles, instead of the ordinary axletree, the inner ends of the spindle being secured in boxes *a*, (shewn by dotted lines,) in the frame-work of the carriage. By this arrangement, the body can be placed nearer the ground, and the centres of the wheels may be made to coincide with the line of traction.

Fig. 2, represents a side view of a carriage, the wheels of which are removed, and two rings or zones *b*, substituted for them. Against the inner edges of these zones, four friction rollers *c*, attached to the framing of the carriage, act, and cause the rings to revolve, when power is applied to draw the carriage forward.

Fig. 3, shows an improved waggon, the body of which can be easily separated from the framing, and as speedily attached. *d*,

is the body, suspended by metal bands *c*, from two cross-heads *f*, connected by rods *g*, with a square balance beam *h*, hinged to the axletree of the waggon. From this beam a lever *i*, projects, having a rope attached to its end, which passes under the pulley *j*, to the windlass *k*, mounted on bearings in the pole *l*, which extends horizontally forward from the axletree, and carries the shafts of the waggon. *m*, is a link or staple, which is slipped over the end of the lever *i*, for the purpose of retaining the body of the waggon in its raised position.

To lower the body of the waggon, the end of the lever *i*, is released from the link *m*, when the weight of the body will cause it to descend, elevating the end of the lever *i*; the descent of the body being regulated by means of the windlass *k*. The body is raised again by winding up the rope until the lever *i*, returns to the position shewn in the drawing.

The patentee claims, firstly, a passenger carriage, constructed on the principles hereinbefore stated, and shewn in fig. 1, in which the main body part of the carriage is connected with the wheels, and the wheels with each other, by spindles, instead of by an axle.

Secondly.—The form of passenger carriage, constructed on the principles aforesaid, and represented in fig. 1, in which wheels of the ordinary form are dispensed with, and instead thereof, rings or zones, with friction rollers, or other equivalent rotary agents working therein, are used; which rings or zones girdle or circumscribe the body of the carriage, at points removed more or less inwards from the outer sides of the said body.

Thirdly.—The form of waggon, constructed on the principles aforesaid, and shewn in fig. 3, where the part appropriated to the load, or main body part, is suspended below the centre of bearing, and in such manner, that the same can be conveniently detached from the wheels when loaded, or attached when unloaded.—[*Inrolled in the Inrolment Office, June,* 1835.]

Scientific Adjudication.

COURT OF QUEEN'S BENCH.

BEFORE LORD CHIEF JUSTICE DENMAN.

June 25, 1842.

BERRY *v.* CLAUDET.

This was an action brought by Mr. Beard, proprietor of the Daguerreotype patent,* in the name of Berry, (the original patentee, from whom the patent right had been purchased,) against Mr. Claudet, to compel him to give up a license he had obtained to use this invention. Previous to the assign-

* For specification of this patent see Vol. XVI, p. 1, of our present series.

ment of this patent to Mr. Beard, it appears that a license had been granted to Mr. Claudet, by Messrs. Newton and Berry, agents to Messrs. Daguerre and Niepce, the inventors, empowering him to use a certain number of machines for taking Daguerreotype pictures, and dispose of the same,—consequently the patent right could only be purchased by Mr. Beard, subject to the existing license. There was, however, a clause in the said license, empowering Mr. Claudet to relinquish such license, and to recover the purchase-money, in the event of the patent being sold.

The reason for introducing this clause was, that it having being considered probable, from the importance of the invention and its extensive usefulness, as an auxiliary to the fine arts, that either the English Government, the Royal Society, or some other public body, might purchase the patent right, for the purpose of throwing it open to the public,—Mr. Claudet's license would then have become useless.

This case was argued on the 7th of June last; it came before the Court,* on a demurrer to the declaration. One of the points argued, and the only one on which the judgment proceeded, was the construction of the clause in the license granted to the defendant by the plaintiff, to use the Daguerreotype apparatus The facts and arguments are so fully stated in the judgment, as to make it unnecessary to repeat them.

The Counsel for the plaintiff was Mr. Fortescue,—for the defendant, Mr. Peacock.

JUDGMENT.

Lord Chief Justice:—"This was an action of covenant against the defendant for not re-selling and transferring to the plaintiff or his principal all his interest under an indenture of license to exercise a patent. There is no express covenant to that effect in the indenture, but the plaintiff contends that there is an implied covenant, it being the manifest intention of the parties apparent upon the face of the indenture, that the defendant should, under the circumstances, re-sell and transfer.

By the indenture, the plaintiff as agent to two French gentlemen (and as trustee for whom he had obtained a patent,) in consideration of £200, granted to the defendant a license to use the patent for the remainder of the term. The indenture contains a covenant, that if the plaintiff should grant licenses to other persons on terms more advantageous than those granted to the defendant, he would pay the defendant such sum of money as would put him on an equality with those persons; and then the indenture proceeds: 'Provided, and it is hereby further agreed and declared, that if, at any time during the continuance of the Letters Patent, and the license hereby granted, any contract or agreement should be made or entered into, by or on behalf of the said Daguerre and Niepce, with the government of Great Britain, or with any person whatsoever, for the purchase of the rights and privileges granted by the Letters Patent, it shall be compulsory upon the said Daguerre and Niepce, their executors, administrators, and assigns, to re-purchase the interest hereby granted to the said Claudet, or such other persons as aforesaid, by paying to the said Claudet, or to such other persons as aforesaid, the consideration money paid by Claudet for the purchase of the license hereby granted, and giving him or her full power to dispose of and re-sell for his or their benefit, all the stock and apparatus, plates, designs, or tracings, he or she may then have on hand unsold.'

The declaration then states, that the rights and privileges granted, have been disposed of to a person named Beard; that the plaintiff and his principals have been ready to re-purchase by paying to the defendant the consideration money, and giving him full power to dispose of the stock on hand, but that the defendant had refused to re-sell or transfer his interest upon the terms aforesaid.

* Lord Denman, Chief Justice Pattison, Williams, and Coleridge—Judges.

The case of Saltown v. Houston, in 1st Bingham; Sampson v. Easterly, in 9th Barnewall and Cresswell, and the same case in error in 6th Bingham, were cited, to show that the Court will collect from all the words of an instrument what is the intention of the parties, and that no particular words or expressions are necessary to constitute a covenant.

Other cases also were referred to, to illustrate the same doctrine, as to which no doubt whatever can be entertained.

Acting upon that doctrine, and looking to the whole of this indenture, we are satisfied the intention of the parties was to make the re-purchase of the defendant's license by the payment of the consideration money, compulsory upon the granter of the license, Daguerre and his colleague only; and that the proviso was intended for the benefit of the defendant, and was not meant to be compulsory on him; and that he may, if he please, relinquish it.

We are therefore of opinion that there was no covenant expressed or implied."

Judgment is therefore given for the defendant.

COURT OF QUEEN'S BENCH.

BEFORE SIR J. T. COLERIDGE, KT.

July 4, 5, & 6, 1842.

QUEEN v. JEREMIAH BYNNER.

Counsel for the Crown, the SOLICITOR-GENERAL, Messrs. FITZROY KELLY, HINDMARCH, & H. HILL.—For the defendant, the ATTORNEY-GENERAL, Messrs. M. HILL, CROMPTON, and WEBSTER.

This was a *writ* of *scire facias* to repeal a patent, granted to the defendant, for improvements in lamps, dated 9th December, 1837, (see Vol. XIV., p. 115, of our present Series.) The invention was called "the solar lamp," and consisted in forming a deflecting surface, in connection with a glass chimney, by which the air, in passing to supply the burner of the lamp, was caused to impinge upon the flame above the point of ignition.

The principal part of the evidence consisted in the production of a number of old lamps, said to possess the same properties, and scarcely if at all differing in the construction of the essential part, called the deflector.

Lamps on the principle of Simpson's Patent of 1812, and of Upton's Patent of 1827, were produced to the scientific witnesses, and their opinions taken thereon, as to identity in principle with that described in the defendant's specification. The deficiency and ambiguity of the specification and its drawings, were insisted upon, and ultimately five points were left for the consideration of the Jury, viz.—First: Whether a precise size of aperture in the deflector and height above the flame, was essential to produce the effect?—The Jury were of opinion that it was essential.

Second:—Whether the specification, aided by the drawings, sufficiently described such size and height?—The Jury considered that the specification and drawings did not show it.

Third:—Whether the peculiar glass chimney described, as essential to produce the fullest effect, was beneficial; and whether the invention could be used with ordinary chimnies of glass?—The Jury found that the peculiar glass chimney, described, would not produce the fullest effect, and that the invention could not be used with ordinary chimnies of glass.

Fourth:—Whether the invention was new at the time of granting the patent?—The Jury considered that it was not new at that time.

Fifth:—Whether the patentee BYNNER was the true and first inventor?—To which the Jury replied,—he was not.

The verdict therefore went for the Crown, and the Patent was repealed.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

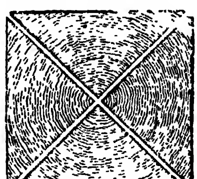
(Continued from page 459, Vol. XX.)

March 1, 1842.

The PRESIDENT in the Chair.

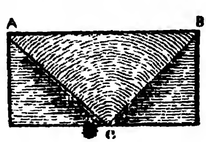
"Description of the Permanent Way of the South-Eastern Railway." By John Pope, Grad. Inst. C. E.

This communication commences with a general description of the slopes of the cuttings and the embankments of the line, and explains the mode of ballasting and the quality of the materials employed. On either side of the bank of ballast, and below the level of its bed, there is an open drain, 3 feet in width, extending throughout the line, which ensures perfect drainage from beneath the sleepers. The different works connected with the laying of the rails are then successively noticed. The sleepers are placed transversely, and differ in shape from any hitherto employed. They are of Baltic fir, and are formed by a square balk being diagonally divided so as to cut out four triangular



Square balk divided to form four sleepers.

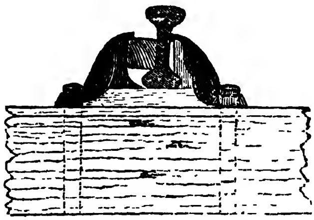
sleepers, which are laid with the right angle C downwards, which



Triangular sleeper A, B, C, contrasted with a half balk.

form (A, B, C,) has as much bearing surface as one of twice the cubic content cut out as a half balk in the usual manner. The advantages arising from this form in the economy of timber, the facility of packing, and the improved drainage of the ballast in contact with the sleepers, are pointed out, and the apparent dis-

advantage of the tendency to act as a wedge, is combated by showing that the inclination of a right angle exceeds the limits within which the principle of the wedge obtains. The chairs are



Elevation of Chair, showing the inclination of the Rail.

of a peculiar form designed by the engineer to combine lightness with strength; they are cast on a plan invented and patented by Messrs. Ransome and May, of Ipswich, whereby the inward inclination of the rails, instead of being made to depend merely upon the rail layers (as is usually the case), is effected entirely by the shape of the cavities of the chairs, which are all cast with peculiar accuracy. The uniformity of inclination attained by this improvement greatly diminishes the lateral motion of the carriages, observed on almost all other lines of railway. The chairs are placed horizontally on the sleepers, and are fastened down with trenails of oak compressed by the patent process of Messrs. Ransome and May. The wedges employed to secure the rails in the chairs are similarly compressed. Details are then given of the rails, which are parallel, with their upper and lower tables of equal breadth: of the amount of compression of the wedges and trenails, their dimensions, shapes, &c.

The author concludes by stating, upon the authority of Mr. Barlow, the resident engineer of that part of the line, that the passage of 70,000 tons of ballast over several miles of the "permanent way" already completed, has not rendered the slightest repair necessary, although the weather has been very unfavourable.

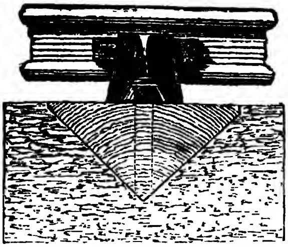
The paper is accompanied by a Drawing showing the construction of the permanent way, and it was illustrated by the exhibition of a pair of sleepers with two pieces of the rails placed in the chairs, which were fixed down with the compressed trenails, complete as on the railway; all the tools employed in laying the permanent line; and specimens of teak, oak, mahogany, hornbeam, walnut, and other timber, compressed and cut so as to show the subsequent form of the sap vessels.

In answer to questions as to the compressed fastenings, Mr. May explained that the peculiarity of the system consisted in the fibre of the timber being compressed equally from the circumference to the centre. The pieces of wood for the wedges were cut out with parallel sides and forced by hydraulic presses into tapering moulds; whilst in those moulds they were subject to the action of heat applied through the medium of low pressure steam, and after being allowed to cool, they were forced out of the moulds, and so long as they were kept dry would retain their form; but as the operation simply contracted the dimensions of the sap vessels without crushing the fibre, the power of capillary attraction was not destroyed, and when driven into the chair and exposed to moisture they swelled so as to remain perfectly tight. There was this difference between wedges so compressed and all others; that a true wedge was formed from a piece of wood cut parallel on all sides, whilst all former modes that he was acquainted with, produced, not wedges, but parallel pieces.

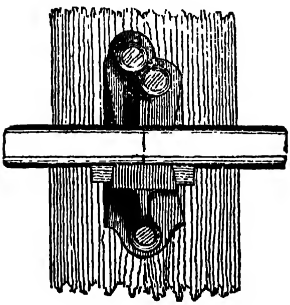
The diminution of the bulk of the trenails, by the process, is from 100 to 63, and of the wedges from 100 to 80. It is found that the wood does not swell until it is placed in a damp situation, as in the sleepers. Even the most solid woods, such as African teak, can be compressed without sustaining injury. Perfectly seasoned timber will not shrink after compression, but green wood will shrink after the process. One of the principal advantages of the compressed trenails, is the firmness with which they hold into the sleeper. Around the iron spikes generally used, a sheath of rust is formed by the damp sleeper; the shaking of the carriages tends to draw them upwards, and the elasticity of the fibre around the hole in the sleeper, being impaired, it is of no use to drive them down again in the same place, and the chairs eventually become loose.

The mode of casting the chairs was described to be by placing an iron plate on each side of the pattern, ramming them up in sand, and using an iron core, which being sustained in its position by a projecting tongue falling into a groove in the side plates, preserves an uniform inclination of the rail in the chairs. Extraordinary precision is thus obtained, and only about 2 per cent. of waste-castings are made, although they are subjected to a rigid test, for if the bearing points allow the rail to vary $\frac{1}{16}$th of an inch from the required inclination, they are broken up. The iron cores do not unduly chill the metal, and the average strength is retained. The iron used is chiefly "Welsh Cold Blast."

JOINT CHAIR.

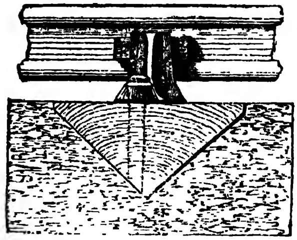


End view.

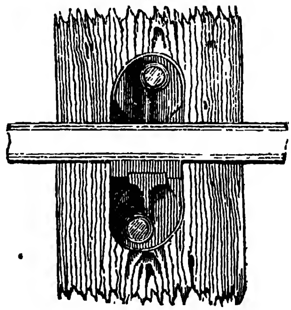


Plan.

INTERMEDIATE CHAIR.

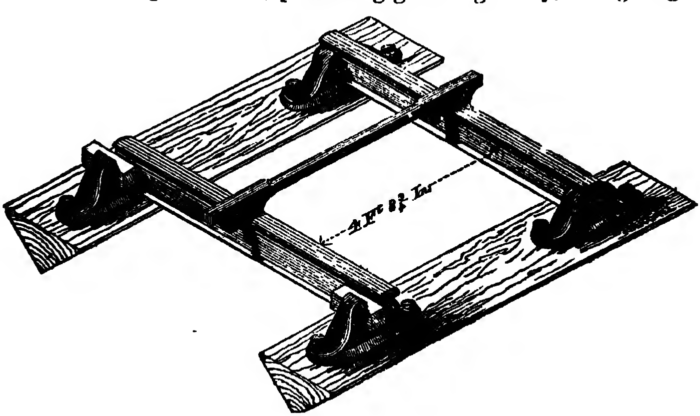


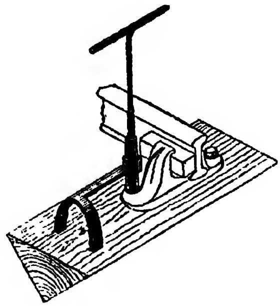
End view.



Plan.

Mr. Cubitt's object has been to lay a railway entirely upon transverse sleepers, of such a form as would expose the largest amount of bearing surface for the least portion of timber; that the bulk of the ballast should be beneath the bottom of the sleeper, where alone it is useful; to use only the best foreign timber; to have the rails rolled uniformly and sufficiently heavy; the chairs simple in form, possessing great regularity, and giving





Guide Tube and Auger.

the inward inclination to the rail within the chairs, instead of depending upon the rail-layer doing it in fixing them; and that the fastenings should be simple, but firm, and not liable to breakage, or to be detached by the passage of the carriages.

With these views he had directed four sleepers to be cut diagonally out of each square log of foreign timber, giving about $2\frac{1}{2}$ cubic feet to each sleeper; to place them with the right angle downwards, so that the ballast could always be consolidated by ramming, without lifting the sleeper, or digging around it, as with square, or other formed sleepers; two places are planned to receive the chairs, and one fastening hole bored in each sleeper; they are then kyanized in close tanks, completely filled with the prepared solution, under a pressure of 80 lbs. per square inch. When placed upon the ballast, the joint chairs are first put down 15 feet apart, and the intermediate chairs loosely placed 3 feet apart; "cramp gauges," embracing the inside and outside of the rails, are then fixed between each pair of sleepers, and the wedges along one side driven up—one trenail being driven in each chair, the hole for which is previously bored in the sleeper by a gauge, to insure an equal projection on each side of the rail. A "guide tube" of an internal diameter, to fit the spiral auger for boring the trenail holes, with the external lip tapered to correspond with the hole in the chair, for the head of the trenail, is then used, and by its agency the holes are pierced with great accuracy, concentric with the hole in the chair, at the same time protecting the tool from being injured by the cast-iron. The intermediate chairs are then fixed in the same manner, and the operations are repeated for the opposite rails; the ballast is then consolidated by ramming. It is found that the work proceeds very rapidly; the ballast supports the sleepers throughout, and

has no tendency to fall away from them; the water drains away freely, and hitherto the passage of the ballast waggons over that portion of the line which is laid (although they are without springs) has been productive of benefit rather than injury.

The inclination of the rail being given in the chair, had insured such accuracy, that after one day's traffic over it, the surface of the rails is rubbed equally throughout, and not alternately on either side, as is so commonly the case.

Mr. Cubitt did not claim the invention of the angular-formed sleeper, as Mr. Reynolds had used it before for his longitudinal bearing rails, but he believed that transverse sleepers of that form had not been previously laid down; nor did he claim the compressed wedges and trenails, or the peculiar mode of casting the chairs; the merit of these was entirely due to Messrs. Ransome and May, who had entered completely into his views and wishes, and executed them with extreme intelligence.

In answer to a question from the President, Mr. May replied, that it had been an object to gain in the trenails and wedges, the greatest amount of strength with diminished bulk, and also to cut away as little of the sleeper as possible in boring the holes; he had, therefore, introduced this method of compressing them, with a view also, that in swelling from the damp, they should fix themselves tight into the soft timber sleeper, and hold the chair fast down.

He hoped to extend the use of compressed trenails to ship-building, for which they were eminently adapted; if they were used, smaller holes would be bored in the timbers, and they would hold tighter than the trenails now used, which require to have the points split and wedged up, and the heads also divided and caulked, to prevent leakage through the open sap vessels of the wood.

The President remarked that on the Hull and Selby Railway, the chairs were fastened to the kyanized timber sleepers, by uncompressed wooden trenails.

Mr. Cubitt was not aware of that fact; he had always found that uncompressed wedges and trenails would not hold tight. Some of the compressed trenails had been wetted by accident, and could not be afterwards driven into the holes in the chairs; they nearly resumed their original size, and then showed the marks of the turning tool upon their surfaces. In answer to a question from Mr. Parkes, as to the comparative expense of laying the line, it was rather in favour of the system he had adopted, although the prices paid for the items separately, were higher

than usual, but the saving in labour, and the almost total absence of waste of materials, gave the economy. He then quoted a few of the prices paid; sleepers, 6*s.* 6*d.* each (ready to lay down, including kyanizing); chairs £9 per ton, free from faults in casting, the contractors for them replacing all that were broken in laying the line. Each joint chair, with three trenails and one wedge, 2*s.* 10*d.* Intermediate chairs, with two trenails and one wedge, 2*s.* 1*d.* each. The labour for laying the line was from 2*s.* to 3*s.* per yard running; the cost of fixing the sleepers, laying the rails, and ballasting complete, was from £1,500 to £2,000 per mile, including all expenses.

Mr. Macneill fully concurred in the importance of providing for clear drainage from the sleepers; and in the advantage presented by the angular form for ramming the ballast. The transverse sleepers, with such rails as had been used on the South-Eastern Railway, were preferable to a continuous bearing, as they would prevent the gauge from widening, and preserve an uniform regularity of service, which would tend materially to diminish the oscillating motion so common on railways, and which was so destructive to the engine and the carriages; altogether this railway appeared to be the most perfect he had hitherto seen.

He was using on the Dublin and Drogheda Railway, chairs of somewhat similar construction, with uncompressed wooden wedges and fastenings; they were very roughly cast in Scotland, with hot-blast iron, and the breakage was very great; they, however, cost less than £5 per ton. He believed that chairs, such as were cast by Ransome and May, would be cheaper at £9 per ton. The uncompressed trenails were found in many instances to become loose. In ballasting the railway, as stone was cheap, the whole surface of the line was pitched transversely with thin stones, and then a good bed of broken stone used for ballast, in the same manner as Mr. Telford had proceeded with the Holyhead Road.

Mr. William Cubitt had compressed a considerable quantity of wood wedges, by forcing them singly, by a blow of a piston, through a taper steel mould; on leaving the mould they had attained their ultimate state of compresson, and they were some time before they resumed their original bulk, but he conceived that Mr. May's plan, by which they were dried in a compressed state, enabled them to retain their form longer. He considered the systems of preparation, and of laying the road, to be the most perfect hitherto executed.

Some years since, Mr. Horne had made a series of experiments on the form of timber beams, which presented the greatest amount of strength with the least quantity of timber; he found that a triangular beam, placed with the base upwards, was one-third stronger than any other form.

Mr. Colthurst inquired whether the trenails and wedges had been found to have lost strength by compressing. He imagined that they would not bear a transverse strain so well as before compression.

Mr. May replied, that no experiments had been tried as to the relative transverse strength of timber before and after compression.

Mr. S. Seaward thought it was probable the timber did suffer somewhat from compression, but that did not militate against the system, as there must necessarily be an original excess of strength in the trenails, so that no inconvenience could result from the process.

The President observed, that although uncompressed trenails do draw out of the stone blocks, they hold fast in wood sleepers. The round trenails used to fasten the chairs to the sleepers on the Hull and Selby Railway, were of a proper size to fit the hole in the chair, and at the end a square head was left, which held the chair down.

Mr. Cubitt had frequently seen trenails or plugs driven into stone blocks, to receive the iron spikes which fastened down the chairs; he believed they had also been used for driving through the chairs into the blocks, but he was not aware that they had been used in wood sleepers, until he employed them on the South-Eastern Railway.

In answer to a question from the President, Mr. Lynde explained, that upon the Hull and Selby Railway, trenails were certainly used in conjunction with wooden sleepers; a portion of them were uncompressed, but the greater part were compressed like the wedges; the latter were supplied by Mr. William Cubitt.

Mr. William Cubitt only supplied the wedges; they were compressed as he had previously explained; he believed that the trenails and wedges generally used upon the London and Birmingham, and other railways, were compressed by being driven through steel rings, by heavy mallets, or by a press; they were most frequently used in the stone blocks, to receive the iron spikes.

List of Patents

Granted for SCOTLAND, subsequent to June 22nd, 1842.

To John Cox, of Gorgie Mills, Edinburgh, tanner and glue manufacturer, for certain improved processes of tanning.—Sealed 23nd June.

John Bould, of Ovenden, in the parish of Halifax, in the county of York, cotton spinner, for an improvement or improvements in condensing steam-engines.—Sealed 23nd June.

John Americus Fanshawe, of Hatfield-street, in the parish of Christ Church, in the county of Surrey, Gent., for an improved manufacture of water-proof material, applicable to the purposes of covering and protecting surfaces, bodies, buildings, and goods exposed to water and damp.—Sealed 29th June.

James Boydell, Junr., of the Oak Farm Works, near Dudley, in the county of Stafford, iron master, for improvements in the manufacture of keel plates for vessels, iron-gates, gate-posts, fencings, and gratings.—Sealed 30th June.

Michael Coupland, of Pond Yard, Park-street, Southwark, millwright and engineer, for improvements in furnaces.—Sealed 30th June.

Thomas Banks, of Manchester, in the county of Lancaster, engineer, for certain improvements in the construction of wheels to be employed upon railways.—Sealed 5th July.

John Tresahar Jeffree, of Blackwall, in the county of Middlesex, engineer, for certain improvements in lifting and forcing water and other fluids, parts of which improvements are applicable to steam-engines.—Sealed 6th July.

James Nasmyth, of Patricroft, near Manchester, in the county of Lancaster, engineer, for certain improvements in machinery or apparatus for forging, stamping, and cutting iron and other substances.—Sealed 7th July.

Charles Augustus Preller, of Eastcheap, in the city of London, merchant, for improvements in machinery for preparing, combing, and drawing wool and goats' hair,—being a communication from abroad.—Sealed 13th July.

William Revell Vigers, of Russell-square, in the county of Middlesex, Esq., for a mode of keeping the air, in confined places, in a pure or respirable state, to enable persons to remain or work under water, and in other places, without a constant

supply of fresh atmospheric air,—being a communication from abroad.——Sealed 13th July.

Gottlieb Boccius, of the New Road, Shepherd's Bush, in the county of Middlesex, Gent., for certain improvements in gas, and on the methods in use, or burners for the combustion of gas.—Sealed 14th July.

John Hall, of Breezes hill, Ratcliff-highway, in the county of Middlesex, sugar refiner, for improvements in the construction of boilers for generating steam.—Sealed 18th July.

John Elliott Fox, of Finsbury Circus, in the city of London, Gent., for improvements in steam-engines,—being a communication from abroad.—Sealed 18th July.

New Patents
SEALED IN ENGLAND.
1842.

To John Harrison Scott, of Somers Town, engineer, for certain improvements in metal pipes, and in the manufacture thereof. —Sealed 6th July—6 months for inrolment.

George Edmund Donisthorpe, of Bradford, Yorkshire, top manufacturer, for improvements in combing and drawing wool, and certain descriptions of hair.—Sealed 6th July—6 months for inrolment.

Joseph Hall, of Cambridge, agricultural implement maker, for certain improvements in machinery for tilling land.—Sealed 6th July—6 months for inrolment.

Lady Ann Vavasour, of Melbourne Hall, Yorkshire, for improvements in machinery for tilling land.—Sealed 7th July—6 months for inrolment.

Richard Hodgson, of Montague-place, in the county of Middlesex, Gent., for improvements in obtaining images on metallic and other surfaces.—Sealed 7th July—6 months for inrolment.

James Timmins Chance, of Birmingham, glass manufacturer, for improvements in the manufacture of glass.—Sealed 7th July —6 months for inrolment.

Charles Augustus Preller, of Eastcheap, merchant, for improvements in machinery for preparing, combing, and drawing

wool and goats' hair,—being a communication.—Sealed 7th July—6 months for inrolment.

William Fairbairn, of Manchester, engineer, for certain improvements in the construction of metal ships, boats, and other vessels, and in the preparation of metal plates to be used therein.—Sealed 7th July—6 months for inrolment.

John Perring, of Cecil House, Strand, hat manufacturer, for improvements in wood paving.—Sealed 7th July—6 months for inrolment.

John Bird, of Manchester, machinist, for certain improvements in machinery or apparatus for raising or forcing water and other fluids, which said improvements are also applicable as an engine, to be worked by steam, for propelling vessels and other purposes.—Sealed 7th July—6 months for inrolment.

William Prichard, the Elder, of Burley Mills, Leeds, manufacturer, for an improved method of consuming or preventing smoke, and economising fuel in steam-engine and other furnaces.—Sealed 7th July—2 months for inrolment.

William Revell Vigers, of Russell-square, Esq., for a mode of keeping the air in confined places in a pure or respirable state, to enable persons to remain or work under water and other places, without a constant supply of fresh atmospheric air,—being a communication.—Sealed 7th July—6 months for inrolment.

Jean Baptiste François Jouannin, of Upper Ebury-street, Pimlico, mechanic, for certain improvements in apparatus for regulating the speed of steam, air, or water engines,—being a communication.—Sealed 9th July—6 months for inrolment.

John Peter Booth, of the city of Cork, merchant, for certain improvements in machinery and apparatus for working in mines, which are applicable to raising, lowering, and transporting of heavy bodies; and also affording assistance in promoting a more perfect ventilation of the mine.—Sealed 9th July—6 months for inrolment.

James Crutchett, of William-street, Regent's Park, engineer, for improvements in manufacturing gas, and in apparatus for consuming gas.—Sealed 12th July—6 months for inrolment.

Thomas Deakin, of Sheffield, merchant, for improvements in the manufacture of parts of harness and saddlery furniture.—Sealed 12th July—6 months for inrolment.

Jean Leandre Clement, of St. Martin's-lane, engineer, for im-

provements in apparatus for ascertaining the temperature of fluids, and also the pressure of steam.—Sealed 12th July—6 months for inrolment.

William Henry Stuckey, of St. Petersburgh, now of Upper North-place, Esq., for a pneumatic engine, for producing motive power.—Sealed 12th July—6 months for inrolment.

Joseph Schlesinger, of Birmingham, manufacturer, for certain improvements in ink-stands and in instruments for filing or holding papers and other articles. — Sealed 16th July—6 months for inrolment.

Robert Benton, of Birmingham, land agent, for certain improvements in propelling, retarding, and stopping carriages on rail-roads.—Sealed 16th July—6 months for inrolment.

Joseph Barling, of High-street, Maidstone, watch-maker, for certain improvements for producing rotary motion in machinery, worked by manual labour.—Sealed 16th July—6 months for inrolment.

John Chatwin, of Birmingham, button manufacturer, for improvements in the manufacture of covered buttons.—Sealed 16th July—6 months for inrolment.

Charles Robert Ayers, of John-street, Berkeley-square, architect, for improvements in ornamenting and colouring glass, earthen-ware, porcelain, and metals.—Sealed 23rd July—6 months for inrolment.

Joseph Partridge, of Bowbridge, near Stroud, Gloucester, dyer, for certain improvements in cleansing wool.—Sealed 23rd July—6 months for inrolment.

Eugene de Varroc, of Bryanstone-street, Portman-square, Gent., for apparatus to be applied to chimneys to prevent their taking fire, and for rendering sweeping of chimneys unnecessary.—Sealed 23rd July—6 months for inrolment.

Alexander Johnston, of Hill House, Edinburgh, Esq., for certain improvements on carriages, which may also be applied to ships' boats, and other purposes where locomotion is required.—Sealed 23rd July—6 months for inrolment.

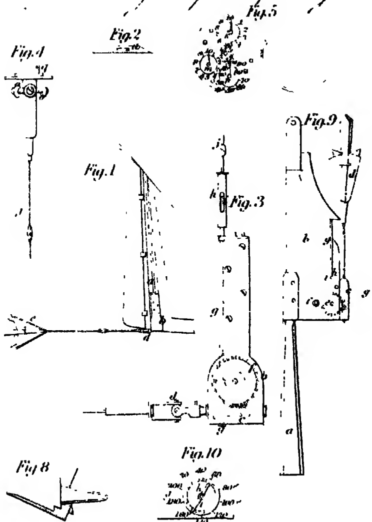
Edward Cobbold, of Melford, in the county of Suffolk, Master of Arts, clerk, for certain improvements in the means of supporting, sustaining, and propelling human and other bodies on and in the water.—Sealed 28th July—6 months for inrolment.

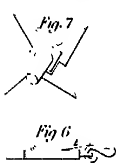
CELESTIAL PHENOMENA FOR AUGUST, 1842.

D.	H.	M.	
1			Clock before the sun 6m. 0s.
—			☽ rises 11h. 18m. A.
—			☽ passes mer. 7h. 3m. M.
—			☽ sets 3h. 38m A.
4	2	49	☿ in conj. with the ☽ diff. of dec. 0. 12. N.
5			Clock before the sun, 5m. 42s.
—			☽ rises 2h. 43m. M.
—			☽ passes mer. 10h. 59m. M.
—			☽ sets 6h. 57m. A.
	6	29	♂ in conj. with the ☽ diff. of dec. 2. 2. N.
	17	38	☿ in the ascending node
6	2	45	Ecliptic conj. or ● new moon.
7	1		☽ in Perigee.
9	1	17	♀ in conj. with the ☽ diff. of dec. 5. 59. N.
	21	59	☿ in conj. with ♂ diff. of dec. 0. 17. S.
10			Clock before the sun
—			☽ rises
—			☽ passes mer.
—			☽ sets
	7	11	☿ in Perihelion
13	5	22	☽ in □ or first quarter.
15			Clock before the sun, 5m. 7s.
—			☽ rises, 10h. 6m. M.
—			☽ passes mer. 3h. 28m. A.
—			☽ sets 8h. 37m. A.
16			Occul *s* Sagitarii, im. 11h. 33m. em. 12h. 41m.
16	11	49	♄ in conj. with the ☽ diff. of dec. 1. 34. N.
	22	19	♃ in conj. with ☽ diff. of dec. 0. 18. N.
17			Mercury R. A. 9h. 21m. dec. 17. 8. N.
—			Venus R. A. 12h. 17m. dec. 1. 41. S.
—			Mars R. A. 8h. 43m. dec. 19. 19. N.
—			Vesta R. A. 7h. 28m. dec. 21. 21. N.
—			Juno R. A. 15h. 52m. dec. 6. 0. S.
—			Ceres R. A. 6h. 44m. dec. 23. 41. N.
—			Pallas R. A. 4h. 50m. dec. 5. 20. S.
—			Jupiter R. A. 18h. 59m. dec. 23. 5. S.
—			Saturn R. A. 18h. 36m. dec. 22. 44. S.
—			Georg. R. A. 23h. 52m. dec. 1. 41. S.
—			Mercury passes mer. 23h. 44m.
—			Venus passes mer. 2h. 36m.
—			Mars passes mer. 23h. 0m.
—			Jupiter passes mer. 9h. 16m.
—			Saturn passes mer. 8h. 52m.
—			Georg. passes mer. 14h. 8m.
18			Occul *o*² Capricorni, im. 13h. 29m. em. 14h. 30m.
20			Clock before the sun, 3m. 13s.
—			☽ rises 6h. 44m. A.
—			☽ passes mer. 11h. 55m. A.
—			☽ sets 4h. 7m. M.
	6	51	♀ in the descending node.
	15	16	☿ greatest Hel. Lat. N.
	18	43	Juno □ ⊙
21	2	14	Ecliptic oppo. or ○ full moon
	19		☽ in Apogee.
23	7	31	Her. in conj. with the ☽ diff. of dec. 6. 8. S.
	9	8	☿ in sup. conj. with the ⊙
25			Clock before the sun, 1m. 57s.
—			☽ rises, 7h. 55m. A.
—			☽ passes mer. 2h. 36m. M.
—			☽ sets, 9h. 49m. M.
29	3	49	☽ in □ or last quarter
30			Clock before the sun, 0m. 31s.
—			☽ rises 11h. 0m. A.
—			☽ passes mer. 6h. 44m. M.
—			☽ sets 3h. 28m. A.
31			Occul δ Geminorum, im. 14h. 57m. em. 15h. 56m.

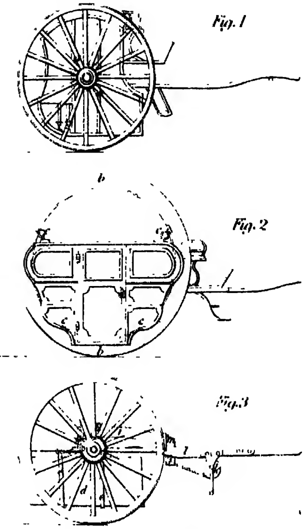
J. LEWTHWAITE, Rotherhithe.

Massey's imp^d ships log

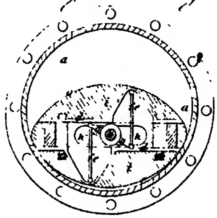




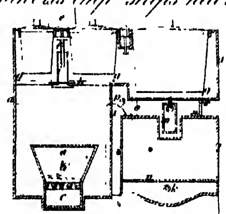
Hansom's imp^d vehicles



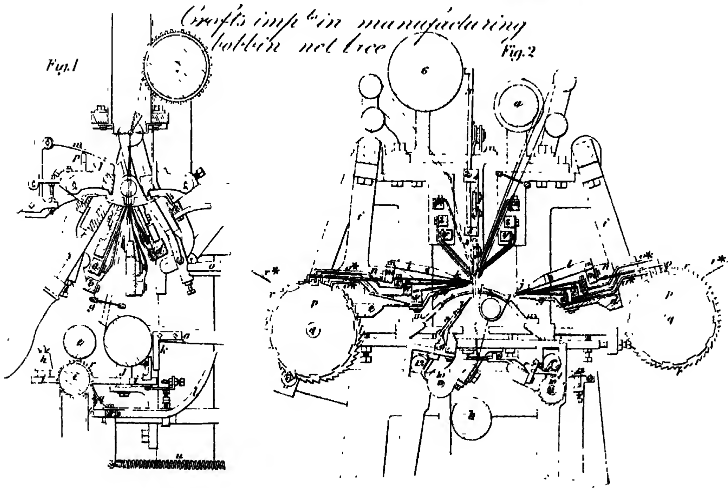
Galloway's steam engine



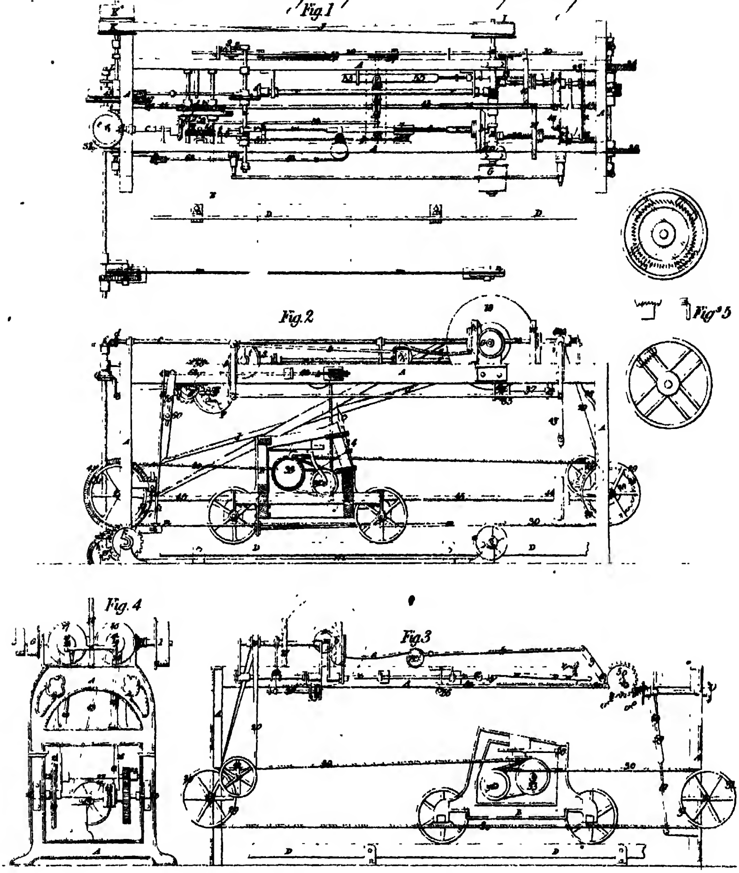
Stothert's imp^d ships hearth



Crofts imp^ts in manufacturing bobbin net lace

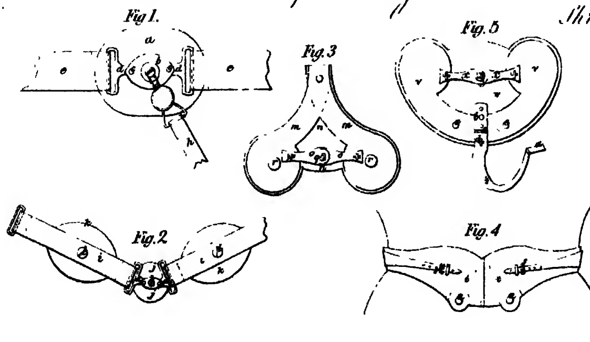


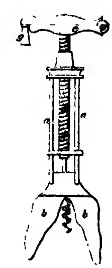
Smith & Hacking's improvements in spinning



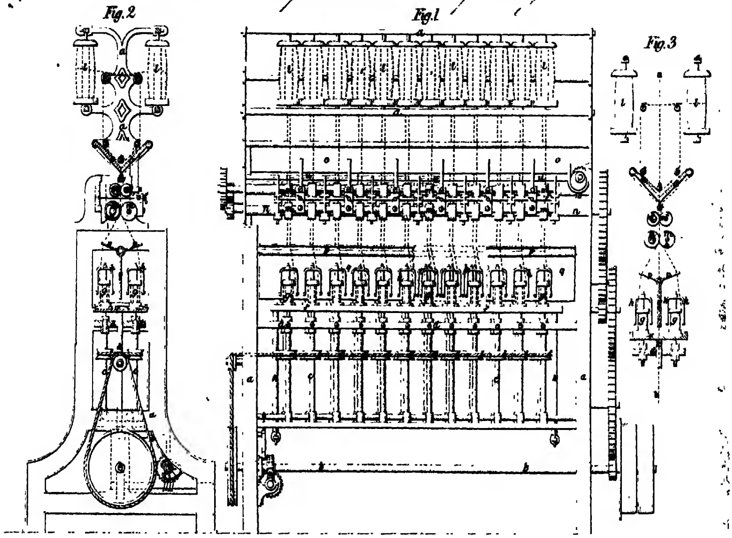
Williams' improved trusses

Shrapnel's corkscrew.

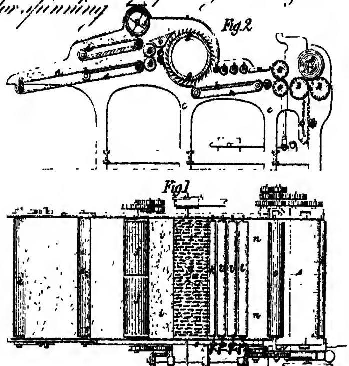




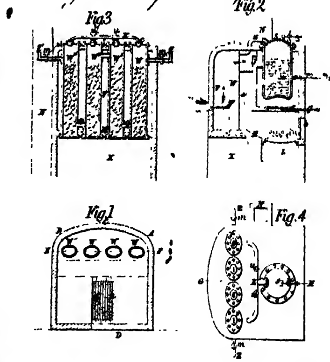
Lawson's improvements in spinning



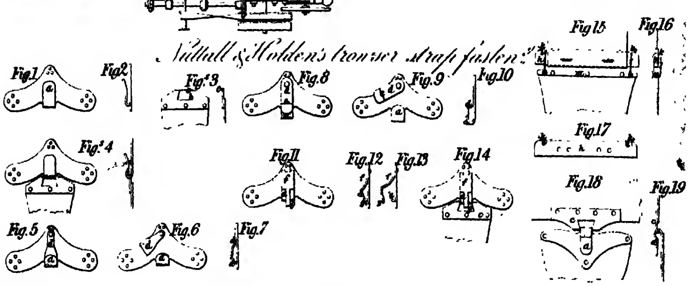
Travers's impts. in preparing cotton &c for spinning



Berry's manufacture of polash



Nuttall & Holden's trowser strap fasten.rs



W. Newton del.

September 1st 1842

THE

London

JOURNAL AND REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXXIX.

Recent Patents.

To Samuel Lawson, *of Leeds, in the county of York, and* John Lawson, *of the same place, engineers and co-partners, for certain improvements in machinery for spinning, doubling, and twisting flax, wool, silk, cotton, and other fibrous substances,—being a communication.*—[Sealed 2nd January, 1840.]

These improvements in spinning, &c., apply to that class or description of machinery called the throstle-frame, and are intended to effect economy of space in the machinery.

By this improved arrangement of parts, two sets of rovings, yarns, or threads, are spun, twisted, or doubled, from one set of drawing and top-rollers, each length of the rovings in spinning, or each pair or more of yarns or threads in doubling, being conducted to separate spindles and flyers, from the nip or points of contact of the lower row of the drawing-rollers.

The spindles and flyers are placed in two rows, at equal distances from a perpendicular line, drawn from the nip or point of contact of the lower rollers, in such a manner that the yarns or threads shall be conducted to the flyers at equal angles, and subjected to equal tension.

In Plate IV., fig. 1, is a side elevation of one of these improved spinning-frames, (having only twenty-four spindles,) as adapted for spinning flax, part of the guide-plates, with the apron, being removed, the better to shew the spindles and flyers in each row. Fig. 2, is a partial transverse section of the same; and fig. 3, is a section, to shew more clearly the line or direction in which the rovings or yarns are passed from the bobbins or spools between the sets of drawing-rollers to the flyers and spindles, and the situation of the same on each side of the perpendicular line a, b, shewn dotted in this figure.

a, a, is the frame-work and standard of the machine; *b, b,* is the first or main driving-shaft, receiving its motion by a band passing from the steam-engine or other first mover, to the fast and loose pullies or riggers on its end; *c, c,* are the rows of spindles, passing through the fixed plate or cross-bar *d,* their lower ends resting in cup-bearings on the other bar or plate *e,* in the usual manner; *f,* is the copping-rail or lifter, supporting the bobbins *g, g*; and *h, h,* are the flyers, attached to the spindles, as in common.

The copping or lifting motion of the bar *f,* is effected in this machine by the heart wheel or excentric cam *i,* acting upon one end of a lever, the other being attached to the legs or vertical bars *k, k,* which support the copping-rail; or the lifting motion may be effected in any other convenient manner. *l, l,* are the bobbins or spools, containing the rovings, threads, or yarns, and are placed in any convenient situation, turning loosely upon pins or wires; and *m**, and *m,* are the two ordinary sets of rollers. These pairs or sets of rollers are constructed after the usual manner, and are actuated by the train of toothed wheels and pinions, leading from the main shaft *b,* to the axle *n,* of the lower set of drawing-rollers *m,* as shewn in the drawings. *o, o,* is the trough, containing the water for wetting the rovings or yarns, when spinning or doubling flax, hemp, or such like fibrous materials. This trough is placed at or near the centre or middle part of the machine. *p, p,* are the guide-plates, for conducting and

keeping the threads or yarns in their proper situations. These guide-plates have an apron or shield *q*, for the purpose of preventing the water being thrown, by centrifugal force, from the flyers of one row of spindles on to the bobbins of the other row.

It will be seen by the drawings, that the rovings, threads, or yarns, are led or conducted first over the stationary longitudinal rods *r, r*, then down under other like rods *s, s*, and afterwards pass under another similar rod *t*, situate within the bottom part of the trough; and thereby the yarns or rovings are caused to pass through the liquid contained therein. The yarns, threads, or rovings, then pass over the edges of the trough, and again meet at another longitudinal bar *u*, where they are crossed, and pass over the opposite edges of this bar, and again meet at the nip or point of contact of the top or retaining rollers *m**; they then pass between the lower pair of drawing-rollers *m*; and as these rollers have a more rapid motion given them than the top pair, the rovings become elongated.

From the lower drawing-rollers, the yarns or threads are passed through holes in the guides *p, p*, to the eyes on the ends of the flyers *h*, which, by their rotation, cause the yarns or threads to become twisted or doubled, as the case may be, the same being wound upon the bobbins, in the usual manner. When spinning, doubling, or twisting cotton or silk, the water-trough may be dispensed with.

The patentees claim the general arrangement and construction of throstle or spinning, twisting, and doubling-frames or machinery, of this class or description, whereby two sets or rows of spindles, bobbins, and flyers, placed at equal distances from the perpendicular line, drawn from the nip or point of contact of the lower drawing-rollers, are made to act in conjunction with one set of drawing-rollers, and in such a manner, that the two threads or yarns, in spinning, or the two pairs or more of yarns or threads in doubling and twisting, shall have equal tension, strain, or drag, as herein above set forth.—[*Inrolled in the Rolls Chapel Office, July,* 1840.]

Specification drawn by Messrs. Newton and Son.

To Edwin Travis, *of Shaw Mills, near Oldham, in the county of Lancaster, cotton-spinner, for certain improvements in machinery or apparatus for preparing cotton and other fibrous materials for spinning.*—[Sealed 15th July, 1840.]

These improvements in apparatus for preparing cotton and other fibrous materials for spinning, consist in a novel construction and arrangement of mechanism for spreading or levelling the cotton or other fibrous material more evenly, in the preparation process, than has hitherto been accomplished; thus enabling the ordinary lapping-machines to produce laps or rolls of equal substance or thickness throughout.

In plate IV., fig. 1, is a plan or horizontal view of the machine, as seen from above; and fig. 2, is a longitudinal section, taken vertically through the machine.

An ordinary feeding-table or endless lattice *a, a,* is mounted upon rollers *b, b, b,* and placed in the general framing *c, c, c,* of the apparatus. The cotton or other fibrous material, as it comes from the willow or other opening machine, is placed upon this lattice without being weighed. An upper endless lattice *d, d,* is provided, for the purpose of forming a receiving-box, for measuring the utmost quantity that can be passed through the machine. The cotton is now drawn forwards by means of the lattices, and passes through a pair of plain regulating or adjusting-rollers *e, e,* for the purpose of admitting a greater or less quantity of cotton to the fluted feed-rollers *f, f.*

It must be observed, that these rollers *e, e,* should revolve considerably slower than the lattices *a,* and *d,* in order to resist the pressure or friction of the lattices. *g, g,* is a cylinder of wood or other material, the periphery of which is covered with pegs or blades. This roller is for the purpose of breaking off the cotton from the feed-rollers *f, f,* and depositing it upon another endless travelling lattice *h, h,* where but one certain quantity of cotton can be received; and as more than the required quantity may be given in

this position, the surplus is carried over by the toothed roller *g*, stripped off by the blade *i*, and passed forward under the cage-roller or perforated dust-cylinder *j*, between which and the lattice *d, d*, it is again discharged upon the first feeding-lattice *a, a*.

There is a fluted roller *k*, upon which the cotton is thrown, and thereby preserved uniformly light. *l, l, l*, are three rollers, with plain surfaces, which are designed to act upon the surface of the cotton, in order to assist it forward. The speed of these rollers must be gaining upon the speed of the travelling under-lattice *h, h*, upon which the cotton is now deposited, and regulated or adjusted to a certain thickness, by means of the smooth board or plate *n*, extending the entire width of the machine, and thus forming a box or chamber for the passage of the cotton. The dimensions or space of this box or passage may be fixed or adjusted, according to the quantity of cotton to be passed through.

Now, as the upper side of the stratum of cotton is slightly pressed by the rollers *l, l, l*, and the under side by the lattice *h, h*, the two delivering-rollers *o, o*, are intended, by having a slower motion than the rollers *l*, and lattice *h*, to impede or retard the passage of the cotton, whereby the box becomes charged to the mouth or receiving part; in consequence of which, more cotton coming forward than the slow speed of the rollers *o, o*, will take away, is cast back by and over the cylinder *g, g*, as before described. An intermediate roller may be placed at *p*, for the purpose of preventing any cotton being carried round the under side of the lattice.

The cotton is now taken, as above described, in a thin even sheet, by the rollers *o, o*, and passed forwards, and formed into a lap or roll, by the ordinary lapping-machine, as shewn at A, B.

In order to ensure a perfect levelling or spreading of the cotton, the spreading apparatus is shewn both before and behind the toothed cylinder *g*; but it will be evident, that either arrangement, whether separate or combined, may be suitably employed for this purpose.

The patentee remarks, that all these various lattices, rollers, and other parts of the mechanism, are represented as suitably geared, and receiving rotary motion from the strap-pulley *p*; but to this precise arrangement or construction, he does not intend to confine himself, as that or any other slight modification of the apparatus might be readily varied, without interfering with the object of the improvements.—[*Inrolled in the Petty Bag Office, January,* 1841.]

Specification drawn by Messrs. Newton and Son.

To JOSEPH WILSON NUTTALL, *of Belper, in the county of Derby, draper, and* HENRY HOLDEN, *of the same place, tailor, for improved apparatus, to be attached to trousers, commonly called trousers-straps.*—[Sealed 5th April, 1841.]

THIS invention consists of certain improved constructions of hooks and catches, by means of which the gaiter or trousers-strap, or other fastening to be passed under the foot, may be attached to, or detached from the gaiter or trousers, with very great facility.

In Plate IV., views of several different constructions of festenings are shewn, the upper part of which must be sewed on to, or otherwise connected to the bottom of the trousers or gaiter, whilst the under part or catch is riveted or otherwise connected to the strap which passes under the foot.

Fig. 1, in the accompanying drawing, represents a front view, and fig. 2, a side or edge view of the most simple form of hook, consisting merely of a flat piece of metal, with suitable holes drilled in it, for sewing on to the trousers, and having a bent-up tongue *a*, formed, by turning up, in the manner shewn in fig. 2, a portion of the flat piece of metal. Fig. 3, represents a front and side view of the staple-catch or eye-piece, which is made fast to the end of the leather or other strap, by rivets or other means.

The eye-catch or staple *b*, having been punched out of

a piece of plate metal, its outer edge *c*, is turned over nearly at right angles, forming a lip, as shewn in the edge view.

In connecting these, as represented at fig. 4, the catch, at the end of the strap, is brought nearly into a horizontal position, as shewn by dots in the edge view, by which means the lip-edge is enabled to slide freely between the tongue *a*, and the plate of the hook-piece; and when so connected, will hang down in the manner shewn, and not be liable to rise and slip out, in consequence of the lip *c*, being wider than the passage between the upper part of the tongue *a*, and its plate.

Figs. 5, 6, and 7, represent another construction of hook-piece. In this instance, the tongue *a*, has a moveable cover *d*, attached, by a pivot, to the plate; and the catch or staple *c*, of the strap, when connected to the tongue-piece, is prevented from becoming unfastened, by means of the cap-piece or cover *d*, which completely closes the opening of the hook, as seen in the edge view, at fig. 7.

A slight modification of the same hook, without any essential difference, but merely in the form of the sliding-cap or cover *d*, is shewn at figs. 8, 9, and 10. In the ledge of the sliding-cover there is a little slot at *e*, which, when the cover is shut down, as at fig. 8, causes the upper edge of the tongue *a*, to spring into it, and thereby keep the cover secure in its place.

Another description of fastening, in which the hook is closed by a lever-cap or cover *f*, is shewn in figs. 11, 12, 13, and 14. Fig. 11, is a front view of the fastening, and figs. 12 and 13, side views of the same. The hook is closed by the falling of the lever *f*, which turns on a hinge-joint above, and has a nib or elongation *g*, at bottom. Fig. 13, represents this piece raised, in order to admit the eye-catch or staple *c*, of the strap. In passing the catch or staple on to the hook, the lip of the catch-piece striking against the nib *g*, raises the lever *f*; and when the catch-piece falls into its place, as shewn in fig. 14, the lever assumes the closed position, and is prevented from being opened, merely by the accidental rising of the catch, owing

to the nib *g*, passing behind the lower edge of the staple or eye.

A fastening of another construction, essentially different from either of the above, is shewn at figs. 15, 16, and 17. Fig. 15, representing a front, and fig. 16, an edge view of this contrivance. The fastening consists of a straight bar of metal *h*, (see fig. 17,) which may be attached or connected to the trousers by sewing, or in any other manner that will allow of its being easily removed when the trousers require washing. At each end of this bar *h*, there are notches *i*, *i*, covered by a flat spring *k*, *k*, slightly turned up at its ends.

The corners of the metal bar *h*, are rounded off, in order that the loops *l*, *l*, (which are attached by joints to a bar *m*, connected to the leather or other strap,) may be easily passed into the notches *i*, *i*, and thereby made secure, as seen in the figures 15 and 16. These jointed loops are easily removed from the bar, and the fastenings disengaged when required, by lifting the ends of the springs *k*, *k*, and sliding the loops *l*, *l*, over the ends of the bar.

Figs. 18 and 19, represent a similar construction of fastening to figs. 1, 2, 3, and 4; but, in this instance, the staple-catch is attached to the trousers, and the hook to the strap. —[*Inrolled in the Petty Bag Office, October,* 1841.]

Specification drawn by Messrs. Newton and Son.

To MOSES POOLE, *of Lincoln's-inn, in the county of Middlesex, Gent., for an invention of improvements in producing and applying heat,—being a communication.*— [Sealed 26th June 1841.]

THIS invention consists, firstly, in a new mode of heating furnaces, used in the different manufactures, by employing carbonic oxide gas as fuel, instead of coal, coke, peat, or wood. In the manufacture of iron and other metallurgic operations, where blast furnaces are used, this carbonic oxide gas is obtained in a pure and uninflamed state; from

these blast furnaces it is taken some distance below their mouth, and conveyed to any other furnaces requiring heat. Secondly, in a new mode of heating furnaces by means of carbonic oxide gas, which may be obtained from a separate furnace, expressly constructed for that purpose. Thirdly, in a mode of applying the blow-pipe to furnaces, whereby the withdrawal of the carbonic oxide gas, in the working furnaces, is facilitated, and the combustion in the furnaces or boiler, assisted by the mixture of heated air with the carbonic oxide gas, thus producing a most intense heat.

This invention may be applied to the furnaces used in the different processes for the manufacture of iron, and the treatment of other minerals generally, as well as to ovens or furnaces requiring a high temperature, such as glass or pottery furnaces, gas works, breweries, for evaporating liquids, and to the purpose of generating steam.

The improvements are first shewn as applied to the manufacture of iron, as large quantities of combustible or carbonic oxide gas, are necessarily produced in blast furnaces. These are collected before they arrive at the top or mouth of the furnace, and conducted, under a pressure, into the refining, puddling, and welding furnaces. Here they are ignited, and continued jets of heated air are forced through a series of blow-pipes amidst the inflamed gases, whereby their combustion is so completely effected, as to heat the furnaces to an intense degree, without the use of any other fuel.

In cases where the carbonic oxide gas cannot be obtained from a blast furnace, a separate furnace should be constructed, for the purpose of generating the gas, which is thence conducted into the smelting, or refining, puddling, and welding furnaces. This separate furnace should be constructed somewhat like a small blast furnace. When filled with coal, a small quantity of atmospheric air is forced in by means of any ordinary blowing machine, just sufficient to produce a slow combustion of the coal; and thus it will generate the required quantity of carbonic oxide gas, the same as a blast furnace. The combustible gas is thence conducted through tubes or pipes, into the furnaces to be

heated. Here it is met by the continued jets of heated air that are forced through the blow-pipes, and the combustion of the mixed hot air and carbonic oxide gas, will produce a most intense temperature. The atmospheric air, that is forced through the blow-pipes into the furnaces, should be heated to about from 250° to 330° Reaumer. The same arrangement may be applied to a cupola furnace, and sufficient combustible gas obtained from it to heat any reverberatory furnace.

In all the furnaces to which the invention is applied, the combustion is most completely effected without a chimney. The atmospheric air, which is forced into the furnaces, is received from any ordinary blowing machine; and the pipes, through which the air, as well as those through which the gas enters the furnaces, must be provided with cocks or slide-valves, by which the quantity of gas and air to be admitted, may be regulated with the greatest exactness. In this manner it is possible to save much of the metal that is lost in the ordinary processes of the manufacture of iron.

In Plate V., at fig. 1, the manner of conveying the gas from a blast or high furnace, is shewn. *a, a, a,* are openings, leading into the vertical channels or passages *b,* and from thence into the chamber *c.* There is a top to this chamber, with openings corresponding to the passages *b*; these openings are closed with cast-iron plates, that can be taken off for the purpose of clearing out the passages *b,* and the chamber *c.* From the chamber *c,* the gas may be conducted in any direction, and to a distance of several hundred feet.

In some localities, and in cases where it is required to take the gas from a blast furnace, in operation, a metal cylinder, of a smaller diameter than the top of a furnace, and of a depth equal to its diameter, is suspended vertically in the top of the blast furnace, the whole of its length. The space between the cylinder and the furnace, at the top or mouth, is to be hermetically closed, and the furnace charged through the cylinder, which must be kept full of minerals and combustibles. Thus the chamber between

the exterior of the cylinder and the interior of the furnace cannot be filled with either minerals or coals, but the gas passes into it, and is conducted thence, as may be required. Sometimes it becomes necessary to heat the gas before it is burnt in the furnaces; for this purpose, the tubes through which it passes, are surrounded by a brick flue, into which the waste heat, from the gas furnace, is conducted.

Figs. 2, and 3, represent a refining furnace, with the necessary apparatus for working it with gas, without the use of any other fuel. Fig. 2, is a vertical section; and fig. 3, a sectional plan view of the same.

The gas, from the blast furnace, is brought into the chamber *a, a,* and passing through an opening *b, b,* it enters the furnace. *c, c,* are a series of blow-pipes, through which the heated air is forced into the furnace. In the space between the part marked *b,* and the tubes *c,* the gas becomes mixed with the heated atmospheric air.

This combustible gas, from the blast furnace, mixed with the heated air, produces an intense temperature in the furnace, sufficient for the operation of refining the iron. The warm air required to burn the gas, is ordinarily obtained from the blowing machine and hot-air apparatus of the blast furnace.

For the purpose of heating to a still higher temperature, (say from 250° to 400° Reaumer,) it is carried through a tube *f,* into the iron chambers *g, g,* or a system of pipes; thence it is led through the tube *h,* into the semi-circular chamber *i,* from whence it passes through the small pipes *c, c, c,* into the furnace.

The metal to be refined, is placed in the space *d, d,* in a liquid state, if the arrangement of the furnaces will admit of its being taken in this state from the blast furnace; if not, it may be brought nearly to that state by the waste heat in the chamber *e, e.* In order to decarbonize the metal, a quantity of warm air, from the pipe *h,* is conducted through the pipe *k,* which is divided into two tubes or tuyeres *l, l,* and blown upon the liquid metal in the space *d, d.* After the metal, in the liquid state, has been ex-

posed for about one hour and a half to the hot air, thus blown upon it, it is run off through the opening *m*, and will be found to be refined metal.

Figs. 4 and 5, shew the application of the invention to a puddling furnace. The difference between this and the refining furnace is not great, and can be best observed from the drawings, which will be readily understood from the foregoing description. The openings *n*, *n*, are for the purpose of letting a stream of cold water flow through the cast-iron piece *o*, *o*, to preserve this casing of the hearth against the destructive effects of the fire.

Fig. 6, shews the application of the invention to a welding furnace, the gas being obtained, as in the other cases, from a blast furnace. It resembles, in general, the puddling furnace, only the interior dimensions and the casing of the hearth are different, as is also the fire-bridge. The pipes, through which the gas is to be conducted to the different furnaces, should be made of cast-iron, and have at least one foot sectional area for every furnace that is to be heated.

Figs. 7, 8, 9, 10, and 11, shew the application of this invention to the purpose of generating steam. In this description of apparatus, a chimney is employed, only at the commencement of the operation. The air is forced into the furnace by any sort of blowing machine, or in any other convenient way. The fuel is introduced into the fire-place, upon the gate *n*, *n*, through the door *a*, which can be closed. The fire-place must be large enough to contain a sufficient quantity of combustible matter to produce heat for several hours. When the fire is first lighted, the combustion takes place in the ordinary manner, by opening the door *d*, and the slide-valve *b*, and carrying through them a current of air, by means of the chimney. This is continued until the steam-engine furnace, or any working engine, is in operation; after which, a blowing apparatus is put in action, that forces the air through the tube *c*, as shewn in fig. 8. The openings *d*, and *b*, are then closed; the air which is forced in passes through the flues *f*, *f*, *f*, which are placed around and under the boiler, thus applying the heat which would otherwise be lost. The

air having arrived at the point *g*, is divided into two portions, one of which passes through the opening *h*, which can be regulated by a valve, into the space below the grate *n*, *n*, to assist in the slow combustion of the fuel. The other part of the air passes through another opening, that can be regulated by the valve g^1, into a chamber *h*, *h*, that surrounds the fire-place, in order to heat the air to an intense degree.

After the second portion of the air has passed into this chamber, it enters into the chamber *i*, *i*; from thence it passes through a series of blow-pipes, or through one opening *o*, of a little less size than the width of the fire-place, into the space *p*, *p*, below the boiler. The incombustible or carbonic acid gas, which is generated, passes through the space *p*, *p*, into a small chimney through the opening *b*, *b*, which is regulated by a valve.

This mode of applying the invention to the heating of boilers, can be modified according to the form and dimension of the boiler; and this part of the invention consists, firstly, in the application of heated air, forced in through blow-pipes, to burn the smoke and combustible gas, which is produced by the slow and direct combustion of the fuel; and secondly, in the above-described manner of heating the air by the waste heat of the fire-place.—[*Inrolled in the Inrolment Office, December*, 1841.]

To Thomas Starkey, *of Birmingham, in the county of Warwick, copper cap manufacturer, for his invention of improvements in percussion caps, for discharging fire-arms.*—[Sealed 16th December, 1841.]

This invention consists in a novel method of manufacturing percussion caps, whereby they are rendered impervious to water, and may, if necessary, be removed from the cone or nipple without any risk or danger of discharging the gun, it being impossible that any portion of the detonating powder, contained in these improved caps, can adhere to

the nipple, which has frequently been the case with the ordinary caps.

These improvements are effected by depositing the fulminating powder between two caps, the one placed within the other; the end of the inner cap being perforated with a small hole, exactly coincident with the touch-hole in the cone or nipple of the gun, in order to allow the fire, from the explosion, to pass through the breech of the gun into the charge of gunpowder within.

In Plate V., two methods are shewn of carrying the invention into effect. Fig. 1, represents an external view of the outer cap or shell, made in the ordinary manner. Fig. 2, is a section of the same, shewing the detonating powder enclosed therein, which is covered by a disc of tin-foil, (represented detached below at *a*); or, instead of tin-foil, a round piece of oiled silk, or other water-proof material, may be used, the object being to protect the powder from damp. Figs. 3, 4, and 5, represent an elevation, vertical section, and top or horizontal view of the cap or shell intended to be placed within the former, a small hole being made in the end of the last-described cap, for the free passage of the fire when exploded, as seen in the drawing. When the improved cap is finished, by the conjunction of the two shells, this hole may be covered with wax or varnish, to resist the wet.

The detonating powder being placed in the end of the cap or shell, fig. 2, and covered, as shewn, the cap, fig. 4, is to be placed within it, and they are then drawn together and united by the ordinary means of drawing percussion caps, thereby making the two into one entire cap, as shewn at figs. 6 and 7.

Figs. 8 and 9, represent the elevation and vertical section of an ordinary copper cap or shell, similar to figs. 1 and 2; but, in this instance, the detonating powder is not placed at the end of the outer cap or shell, but is contained within an inner case, represented in elevation and section at figs. 10 and 11. This inner cap is shewn at *b*, perforated with a small hole, similar to that at fig. 5; the powder is, however, prevented from falling through, by means

of a disc of tin-foil or other water-proof material, placed at bottom of the shell, which also serves to protect it from damp, as in the former instance. This inner shell is intended to receive a small plug of metal *c*, excavated, as shewn in the section, fig. 11. The plug *c*, being placed in the inner shell *b*, confines the detonating powder between them. The shell and the plug are then inserted within the outer shell, and when drawn together and finished, the perfect cap is produced, as represented at fig. 12, and in section at fig. 13.

In reference to the cap, shewn in the figures from 1 to 7, there is no necessity for making the inner cap or shell of so great a depth as that represented at figs. 3 and 4, for one similar to fig. 14, may be used; or, if preferred, a disc of metal, with a hole made in its centre, as at fig. 15, may be inserted into the outer cap, in place of the inner cap.

Another mode of making the cap, is with an indentation or recess at the end of the outer shell, which is done when the piece of metal is in the blank, and the detonating powder is placed therein, and properly covered and protected with tin-foil or other suitable material; then the blank of the inner shell, perforated with the small hole in its centre, is placed thereon, and the two shells formed together by drawing, and the cap finished in the ordinary way.

The patentee claims the construction of percussion caps, in the manner above shewn and described, whereby they are effectually protected from becoming injured by damp; also the detonating powder is prevented from escaping accidentally, when the cap is removed from the cone or nipple, which sometimes happens with ordinary caps; and a more concentrated body of fire is driven through the cone or nipple, by means of these caps, into the breech of the gun, in consequence of a considerable portion of the flame being compelled to pass through the small perforation in the end of the inner cap or metal disc, as above described. —[*Inrolled in the Petty Bag Office, June,* 1842.]

Specification drawn by Messrs. Newton and Son.

To NATHAN DEFRIES, *of Paddington-street, in the county of Middlesex, engineer, for his invention of improvements in gas-meters.*—[Sealed 7th June, 1838.]

IN Plate V., fig. 1, represents the front view, partly in section, of a gas-meter, constructed according to the first part of this invention; and fig. 2, is a section, taken further back in the meter. *a, a,* is the external cylinder, supported by the foot or framing *b.* The cylinder *a,* is divided into two parts, the upper and lower, by the gas-measuring vessels. The lower half of the cylinder *a,* is divided into two quadrants *c,* and *d,* which are so arranged, in the external cylinder *a,* as to leave only a narrow space all around, in order to receive water or other fluid, to make a suitable joint around the measuring vessels, hereafter explained.

The narrow spaces *e, e,* between the vessel *a,* and the sides of the quadrants or quarter-chambers *c, d,* are filled with water or other suitable fluid, at the bent tube *f,* which is kept closed when the meter is in use, as shewn at fig. 1. *g, g,* are tubes, for drawing off the water or other fluid employed; and *h,* is a screw-cap, which closes the end of the tube g^1, into which both tubes *g,* terminate; *i,* is a dividing-plate, which separates the lower part of the meter into two compartments *c,* and *d,* there being a channel *j,* at the upper part of the plate *i,* which receives water or other fluid from the narrow spaces *e,* and thus makes a fluid joint to the centre, between the two gas-measuring vessels, hereafter described, and prevents the gas in one passing therefrom into the other.

The measuring vessels are shewn at *k, l,* and are each quadrants of a circle; they are carried by the same axis *m,* being affixed thereto by a projection *n,* which enters into the channel *j,* (filled with water,) at the top of the quadrants *c, d.* The measuring vessels *k, l,* vibrate on their axes, similar to a scale-beam. The sides of these vessels work in the fluid in the space *e,* and the projection *n,* works in the fluid in the channel *j,* consequently, any gas in the measuring vessel *l,* cannot pass into the vessel *k,* nor can

that in k, pass into the vessel l; hence, each time either of these vessels rise, they will measure a quantity of gas, equal to their capacity of that above the filling parts c, d, and the water or other fluid in the space e.

The pipe o, leads through the top of the meter, and joins the cross-pipe o^1, from which it passes alternately through the pipe o^2, o^3, by the movement of slides o^4, as is clearly shewn in fig. 1. The slides o^4, are affixed on the rod o^5, which is guided in its work by means of the two uprights o^6, having holes, through which the rod o^5, slides freely. The rod o^5, is moved to and fro, by means of the axis of the vessels k, l, there being the slotted arm m_1, affixed on the axis m; and also a weighted arm m^2, affixed on the axis m, to equalize the working of the vessels k, l. The arm m^1, actuates the pendulous rod or lever m^3, which moves on an axis m^4, as is shewn in the drawing. m^5, is a set screw, which works in the slot of the arm m^1, and the distance at which the screw m^5, is set from the centre of the rod or lever m^3, will regulate the distance through which the vessels k, l, shall move, and consequently regulate the quantity of gas they shall measure at each movement.

The upper end of the lever m^3, is formed into a cross-head, the ends of which are bent up at right angles, in order to cause the upper end of the lever m^3, to actuate the weighted tumbler, hereafter explained; and further, there is a projecting stud on the upper end of the lever m^3, which, working in the forked end of the lever m^7, communicates motion to a train of wheel-work, which indicates the number of movements of the vessels k, l; and such wheel-work being properly arranged, in respect to the capacity of the vessels k, l, will indicate the number of cubic feet of gas which has passed through the meter.

The forked lever m^7, works in a suitable stuffing-box, as is shewn in the drawing, to prevent the flow of gas in that direction. m^8, is the weighted tumbler, above-mentioned, which moves freely on the axis of the lever m^3. In the weighted tumbler m^8, a slot or opening is formed, through which a projecting bent wire, affixed to the rod of the

valve, passes; consequently, whenever the tumbler m^8, is moved slightly beyond the centre or vertical position, by the lever m^3, the weight, at the upper part of the tumbler m^8, will cause the tumbler to move suddenly, and reverse the valves, all which will readily be traced in the drawing.

The gas, in passing through the gas-meter, from the point *o*, passes to the lower part of the meter, into the compartments *c*, *d*, the upper part of these compartments being open; consequently, these compartments *c*, *d*, will at all times be full of gas, and the vessels *k*, and *l*, will be raised, according as the gas is, by the position of the valves, flowing into the compartments *c*, or *d*; and a quantity of gas, equal to the capacity of the rising of the vessel *k*, or *l*, will pass out of the chamber *c*, or *d*, by the descending of the vessel *k*, or *l*, in succession. *q*, is a float, and *r*, is a valve, through which the gas must pass, in order to get out at the eduction way or pipe *p*.

It will be seen, that the way to the pipe *p*, is shut off from the upper part of the gas-meter, when the valve *r*, is not open; this will always be the case if the space *e*, is not properly filled with water or other fluid, to float the float *q*.

Figs. 3 and 4, shew two sections of another arrangement of gas-meter, many parts of which are similar to that above described. *k*, and *l*, are two vessels for measuring the gas. In this arrangement, they have each an independent axis, with an arm and balance weights, as shewn in the drawing. On the axis of the vessel *k*, is affixed the arm A; and B, is a rod which connects the arm A, with the crank C, affixed on the axis D, of the valves E, F.—A^1, is an arm, affixed on the axis of the vessel *l*; and B^1, is a connecting-rod, by which the arm A^1, is connected with the crank C; this crank, by means of the connecting-rod G, of the crank H, gives motion to the train of wheel-work, for registering the quantity of gas passed through the meter.

The axis D, passes through stuffing-boxes, formed in the fixed plates of the valves E, F; and on the outer ends of the axis D, are affixed the revolving plates of the valves E, F. The fixed plates of these valves have each four openings, and the moveable plates have only one opening,

but to such an extent, that that opening extends to two openings of the fixed plate; and, it should be stated, that the upper portion of the meter is divided into two compartments, separated from each other, as is shewn in the drawing, in which the vessels *k*, *l*, work; and the gas in the vessels *k*, and *l*, is kept separate by projections *n*, working in channels *j*, containing water or other fluid, as above explained.

The rising and falling of the vessels *k*, *l*, cause the axis D, to revolve, and carry round the moveable plates of the valve E, F.—*o*, is the induction way for the gas, and *p*, is the eduction way, when it has been measured.

By the application of the rotatory valves E, F, and other suitable parts, gas is measured by the descending as well as by the rising of the vessels *k*, *l*; for it will be seen, that two of the openings of each of the fixed plates E, F, open into and from the gas-meter above the vessels *k*, *l*; and the other two openings, of each of the fixed plates of the valves, open respectively into and from the lower part of the meter *c*, *d*, and consequently under the vessels *k*, *l*, as the moveable plates of the valves E, F, are affixed on the axis D, in opposite directions.

When gas is flowing through the valve E, above the vessel *k*, the gas, from under that vessel, will be passing off at the valve F; and at the same time gas will be flowing through the valve E, under the vessel *l*, and the gas above the vessel *l*, will be flowing off at the valve F; and if the valves be set correctly, to produce this effect, the up and down motion, produced to the vessels *k*, *l*, will cause a rotatory motion to the valves E, F, and a constant flow of gas from the eduction way *p*, provided the valve *r*, be open, which it always will be, similar to that above described, when it is raised to the proper position, by water or other fluid, in the space *e*.

Fig. 5, shews another arrangement of gas-meter, constructed according to the third part of the invention:—It consists of an external vessel *a*, *a*, having within it two flexible silk bags or cylinders *b*, *c*, prepared with cocoa-nut tallow. To the upper part of these bags are affixed dished

plates of tin or other suitable metal b^2, c^2. The lower end of the bags are affixed to the projecting flanges on the upper part of the cylinders or chambers b^1, c^1, formed on the partition *d*.—*e*, is the supply-pipe, which is affixed to the lower part of the meter, there being a pipe or trunk, which passes under the cylinders or bags *b*, and *c*, to allow of the gas flowing therein alternately.—This is effected by the valves *g*, *h*, which respectively move on axes *i*, *i*.—*j*, is a rod, by which the valves *g*, *h*, are connected together. Thus, when the valve *g*, is permitting the gas to flow into the cylinder or bag *b*, the valve *h*, will be permitting the gas to flow out of the cylinder *c*.

It will be seen, that over the openings which permit the gas to flow into the cylinders *b*, *c*, small chambers *k*, *l*, are affixed, having openings, by which the gas can pass from the pipe *e*, into the respective vessels, when not covered by the valves *g*, *h*. The gas is permitted to flow out of the cylinders *b*, *c*, by openings *m*, *n*, formed in inclined surfaces, in suitable positions of the cylinders b^1, c^1; and the valves *g*, *h*, are caused to be moved to such an extent, that when the valve *g*, is off the opening in the chamber *k*, it will be closed over the opening *m*; and the valve *h*, is similarly acted upon, in respect to the openings *n*, and that into the small chamber *l*.

m^1, m^1, are cranked rods, attached by pin-joints to the tops or covers of the cylinders b^2, c^2; the other ends of the cranked arms m^1, are affixed to the axis n^1, which moves in suitable bearings in uprights o^1;—p^1, is a slotted lever or arm, affixed to the axis n^1, for giving motion to the valves, as hereafter described; *q*, is an arm, affixed on the axis n^1, there being a projecting stud, which moves the forked end of the lever *r*. The axis of this lever gives motion to a train of wheels, for indicating the quantity of gas passed through the meter.

The arm or lever p^1, gives motion to the lever *s*, by an adjusting screw *t*, passing through the slot in the lever p^1; *v*, is the axis on which the lever *s*, turns; *w*, is a weighted tumbler, moving on the axis *v*, on which is a projecting stud, that is acted upon by the projections s^1, s^1, which

will force the tumbler a little beyond the perpendicular, first one way and then the other; and the weight of the tumbler will cause it to fall quickly, and act upon the valves to change their position, in the following manner:—

x, x, is a forked lever, moving on the axis x^1; between the upper ends (which are turned at right angles) the tumbler at *w*, works, and the lever *x*, works between two studs, projecting from the bar *j*; consequently, when the tumbler *w*, falls, it will, by means of the lever *x*, carry the valves *g, h*, in the same direction, as will readily be understood by examining the drawings; and it will be seen, that the chamber *a*, of the gas-meter, will, at all times, be full of gas, and a constant supply of gas will flow off therefrom, by the pipe *f*.

Fig. 6, shews a partial vertical, and fig. 7, a horizontal section of another gas-meter, combined according to the fourth part of the invention, whereby three flexible surfaces are caused to measure gas. *a, a*, is a six-sided vessel; *b, b, b*, are three flexible surfaces, made of silk, coated with cocoa-nut tallow; these surfaces are affixed across three of the angles of the vessel *a*, and connected to the other angles, in such a manner, as to make them gas-tight; *c, c, c*, are circular plates, affixed to the centres of the flexible surfaces *b*;—*d, d, d*, are three bent arms, moving on axes *e*, the other ends of the arms *d*, being connected, by pin-joints, to the plates *c*;—*f, f*, are rods, which connect the plates *c*, to the crank *g*, formed on the axis *h*; this axis, at its upper end, gives motion to a train of wheels, for indicating the quantity of gas passed through the meter; *i*, is a partition, under which the gas first enters from the pipe *o*;—*j*, is a cylinder, divided into three compartments, from which the pipes *k*, conduct gas, to act upon the surfaces *b, b, b*.

On the upper and under ends of the cylinder *j*, are fixed circular plates, each having three openings. *l, m*, are two circular plates on the axis *h*; the lower plate *l*, being borne up to its seat by a spring, the revolution of the axis *h*, will cause the circular plates *l, m*, to revolve; and as these plates have each a single opening, as shewn in the drawing,

(such openings being set in opposite directions in respect to the axis *h*,) they will so act, that the gas will be flowing into some one or more of the spaces 1, 2, and 3, and at the same time will be flowing through the plate *m*, out of one or more of the spaces, into 4. The upper parts of the spaces 1, 2, 3, are enclosed by triangular plates, in order to prevent the gas passing in that direction, and thus render it necessary that the gas should pass back through the pipes *k*, into the space 4, and away to be burned through the pipe *p*.

The patentee claims, firstly, the mode of combining the parts, as described, in respect of figs. 1 and 2; secondly, the mode of combining two vessels *k*, *l*, in a chamber *a*, actuating a rotatory valve, and such vessel *a*, having narrow spaces *e*, for water or other fluid, as herein described, in respect to figs. 3 and 4; thirdly, the mode of combining two flexible cylinders, or bags, or cylinders *b*, *c*, in a chamber *a*, with suitable vessels and ways, as herein described, in respect to fig. 5; and lastly, the mode of combining three flexible surfaces *b*, in a chamber *a*, with suitable valves and ways for the passage of gas, as herein described, in respect to figs. 6 and 7.—[*Inrolled in the Inrolment Office, December,* 1838.]

To ANTOINE MERTENS, *of the London Coffee House, publisher, for improvements in covering surfaces with wood.*—[Sealed 22nd January, 1842.]

THE first part of this invention consists in combining small pieces of wood, to form blocks for flooring and pavements.

The pieces of wood (which may be of any shape or form, but must all be of the same depth,) are placed in a frame, side by side, and wedged or screwed together; and on the under surface, from one side to the other, grooves are cut, traversing each piece, and laths or tongue-pieces are inserted in them.

Other grooves are cut, transversely to those just men-

tioned, and partially through the laths; and in these another series of laths or tongue-pieces are inserted; then into the spaces between the laths, any suitable cement is run, and when it is cold, the block is removed from the frame.

Another mode of forming or combining blocks, is by the use of cast-iron plates, as shewn in Plate V., fig. 1. *a*, is a plate, having dove-tail ribs or feathers *b*, upon their upper surfaces, into the spaces between which, the blocks or pieces *c*, are driven, the lower edges of the blocks being grooved, in order to correspond with the shape of the ribs *b*.

The second improvement consists in combining small pieces of thin planks, in the manner shewn in fig. 2, so as to form surfaces of great extent and strength, applicable to flooring and roofing houses, &c.

The pieces are arranged in layers, one above another, until a surface of the intended size and thickness is produced, care being taken, that the pieces in each layer shall overlap the joints, as respects each other, and the pieces in one layer shall overlap the joints in the pieces in the other layers,—thus producing a bond, as in brick-laying. The layers are now fastened together by pegs, nails, or screws, and may also be further secured, at the joints, by a coat of any suitable glutinous substance; or, instead of this mode of fastening, each layer may be glued to the next.

The third improvement consists in a method of covering cast-iron rails for railways;—this is intended to protect them, in a great measure, from the shocks and consequent risk of fracture, to which they are exposed when the wheels of the carriages run in immediate contact with them.

A rail, or rather framing, is made of the form shewn at *d*, in the section, fig. 3, and receives a rail of hard wood *e*, upon which the wheels of the carriages travel.

The patentee claims, Firstly.—The method of forming blocks, for covering surfaces, by means of small pieces of wood, joined together by means of keys or feathers, crossing each other on the under side, or by means of an iron plate, with dove-tail ribs.

Secondly.—The method of forming a species of con-

tinuous covering for surfaces, of almost any extent, by the "super-position" of layers of small pieces of thin planks, in the manner described.

Thirdly.—The covering of cast-iron rails, in the manner described.—[*Inrolled in the Inrolment Office, July*, 1842.]

To MILES BERRY, *of* 66, *Chancery-lane, in the county of Middlesex, patent agent, for certain improvements in the manufacture of prussiate of potash, and prussiate of soda, being a communication.*—[Sealed 21st January, 1840.]

THIS invention consists in a more economical method of manufacturing prussiate of potash and prussiate of soda, than has been usually employed. Hitherto, prussiate of potash has only been obtained by incurring the loss of a considerable quantity of azote or nitrogen gas, which, when combined with carbon, forms cyanogen, the generator of prussian blue. This azote is evolved by the distillation of organic substances, contained in certain vegetables, animal oils, &c., but it is obtained in large quantities by the calcination of animal substances, such as horn, blood, muscular flesh, skin, &c. Sometimes the azote is evolved under the form of sub-carbonate of ammonia and nitrogenous oils.

To avoid the loss generally incurred, which is of serious consequence in the manufacturing of prussiate, it is necessary to treat the primary matters in a different manner, so as to collect the azote which escapes during the distillation, and to make it enter into combination with carbon, iron, and potassium; and, moreover, to convert to useful purposes; the azote which has adhered to the carbonaceous residuum. This end is obtained as follows:—

Instead of collecting the sub-carbonate of ammonia, in or by an absorbent medium, it is made to pass through a quantity of charcoal, iron, and potash, placed in an iron tube, kept at a red heat. The carbon, on the one part, decomposes the sub-carbonate of ammonia, and creates bi-

carburetted hydrogen, and at the same time gives up part of it to the azote, which proceeds from the decomposed ammonia, and thereby forms cyanogen, which, in its turn, combining with the reduced potash, forms cyanoferruret of potassium or prussiate of potash. To obtain the most complete reaction, the operator must divide or reduce the ingredients constituting the decomposing compound. In order to effect such a division, either of the following means may be used, according to circumstances.

First method.—Reduce the charcoal into fragments of about the size of a nut or walnut; then dissolve the potash or salts of potash, such as carbonate or nitrate, in an aqueous solvent; in urine, for example, if a great quantity can be obtained easily, and at little cost; otherwise, use common water. With respect to iron, it is to be rendered soluble by the addition of an acid, such as nitric or acetic acid. These preliminary preparations being made, which are simple, the solution of potash and nitre is then to be poured on the charcoal; (the saline lye is absorbed very soon;) then pour in the solution of iron, stir the mixture with a spatula, evaporate the water which has been used as a dissolvent, taking care that the compound does not become calcined during the operation. The compound being dry, is again pulverised and introduced into cast-iron tubes, as will be hereafter mentioned.

The other method, is the substitution of a mechanical division, instead of an atomical or chemical one. To effect this, introduce the potash, nitre, and charcoal, into a barrel with iron filings,—place in the barrel cannon balls; then cause the barrel to revolve on its axis, and the balls will grind the compound, and reduce it to small fragments, which will thereby be mixed together. The compound is then removed from the barrel, and introduced at once into cast-iron pipes, or kept for use in a dry place.

It is not of importance to name any particular proportion in the ingredients employed, as they may be varied according to the will of the operator; but the following proportions have been found to give satisfactory results.

When the dry process is employed with the mechanical

division, take of ordinary potash 20 parts; saltpetre 10 ditto; iron filings 20 ditto; coke or ordinary charcoal 45 to 55 ditto; dried blood 50 ditto; and proceed as above stated. For the wet process or the chemical division, take of ordinary potash 30 parts; saltpetre 10 ditto; acetate or nitrate of iron 15 ditto; coke or ordinary charcoal 45 to 55 ditto; dried blood 50 ditto; and proceed as described.

Whether the wet or dry process be preferred for obtaining or effecting the mixture, the compound ingredients must be introduced, when perfectly dry, in a series of pipes, connected together, and contained in a furnace, similar to that used for the manufacturing of carbonated hydrogen gas or coal gas, employed for illumination. Instead of placing the pipes in a horizontal position, which renders it somewhat difficult to introduce and draw out, or remove the charge, they may be placed vertically; but then the heating is more expensive. If the pipes are placed vertically, care must be taken not to pulverize completely the dry compound, in order that the gases may be able to circulate through them without raising the internal pressure to a dangerous pitch.

The animal matter is placed in a separate compartment and in a cast-iron retort, which is connected with the horizontal or vertical pipes. On this retort is placed a safety valve, to prevent accidents, which might arise from any obstacle obstructing the circulation of the gases through the pipes. The heating of the furnace should be effected as follows:—

It is very essential to bring to a red heat the pipes containing the compound or mixture, before any fire is placed or introduced under the retort, in order that, from the beginning of the operation, the decomposition of the gases may take place. The gas, which is evolved by the decomposition, is inflammable when issuing from the pipes, and the color of the flame will be a sufficient indication of the process of the operation. The color generally differs but little from that of the heated cast-iron pipes in the furnace. When this color approaches to pink, the reaction is almost complete, so that very little, if any, am-

monia has escaped decomposition. When the jet of gas becomes smaller and clearer, while a good fire exists under the retort, the operation is near its end; the animal matter is reduced into azotated or nitrogenated charcoal, which is used, at present, for the manufacturing of prussiate of potash, and which is still to be employed in the same manner, and treated as usual. On the other hand, the azote, ammonia and other gases, by combining with the decomposing substances contained in the pipes, have been transformed into prussiate of potash. The charge must then be directly removed from the pipes, and being at a red heat, it should be thrown at once into water to extinguish it rapidly. The whole must be well stirred and allowed to settle. The clear liquor is then to be drawn off, and this is the strongest solution; warm water is then to be poured on the carbonaceous residuum, and being well stirred, and afterwards allowed to settle, the liquid is drawn off. This operation is continued until the residuum is exhausted. The strong solutions are to be evaporated and allowed to crystallize; the prussiate is then extracted according to the old process. The solutions which will not crystallize, contain carbonated potash; this is extracted therefrom, to be employed again. The same is done with reference to the residuum of charcoal and iron. All this residuum is carried to the following operation, to which is added the animal charcoal, furnished by the first operation, by the calcination of animal matter. Besides this animal charcoal, a proper quantity of fresh charcoal is added, in order to preserve, as far as possible, the same proportions in the decomposing mixture.

After some operations, it may be found, that the animal charcoal is completely deprived of azote; a portion of it is, in such a case, to be laid aside, and a proper quantity of fresh animal charcoal to be substituted.

It will thus be seen, that after a little while, the coke or vegetable charcoal, first employed, is completely set aside, and the whole operation is effected by two kinds of animal charcoal, of which one is almost deprived of azote, and the other contains a great quantity of the same.

Although it is not essential to adopt, exclusively, one system of apparatus, as the operation is more chemical than mechanical; yet an apparatus, for carrying the invention into effect, is shewn, in order that the *modus operandi* may be better understood.

In Plate IV., fig. 1, A, B, C, D, is a horizontal section of a furnace, constructed to receive four elliptical pipes. The furnace is arched, in the part A, C, B, in order to reverberate the heat, and drive it back on the pipes W, W^{1}. W^{11}, W^{111}. These pipes are placed on the focal plane E, F, of the elipsoid. *a*, *a*, represents the grating or bars of the furnace, to be heated with coal or coke; I, I, is the pot or retort, shewn in figs. 2, 3, and 4. This pot or retort is placed in a separate compartment, as seen in fig. 2, which is a vertical section, taken through fig. 4, at the line G, H.—K, is a connecting tube, from the retort and the elliptical pipes W.

In the section, fig. 2, the shape of the tube K, will be better seen; also its cocks *u*, and likewise its connection with the pipes W. *l*, is a safety valve; *s*, the cover of the pot or retort; L, is the ash-pit; and *b*, the door of the furnace; X, is an open space, roofed over, or a kind of shed, close to the furnace, and under it the pipes are emptied.

The arrows indicate the direction of the current of heat. This current traverses the intervals left between the pipes, and ascends behind them, passing through the aperture *j*, in the brick-work, which is provided with a valve or damper for closing it, as required. The heat passes through this aperture, and strikes against the sides of the pot when the valve is open. Another valve *f*, *g*, must also be open to expose the pot or retort to the direct action of the fire. The smoke escapes by a lateral passage into a chimney N.

It must be remarked, that there is a direct communication between the chimney and that compartment of the furnace which contains the pipes, so that the heat, reflected from the part V, strikes on the pot or retort only when the pipes W, W^{1}, W^{11}, W^{111}, are sufficiently heated.

In fig. 3, is shewn an inclined plane M, (also represented in fig. 2,) and the junction-tubes which connect the four

pipes with their gas-burners z, z, and the cocks *m*, m^1.—*r*, *r*, are covers, closing the pipes, and having holes formed in them; these holes are shut by the stoppers *e*.

Whether the pipes are placed in the vertical or horizontal position, it is always proper to be able to change the direction of the current of gas; this is easily done by closing, during one hour, (if the operation is to last two hours,) the cocks *u*, m^1, and opening those u^1, *m*; then the gas passes through u^1, into the branch K, and entering W^{111}, passes through *q*, into W^{11}, through *p*, into W^1, and through *o*, and W, and finally escapes by the burner Z. During the following or other hour, the cocks u^1, *m*, must be closed; the cocks *u*, m^1, being opened, the current then goes from *u*, into K, W, W^1, W^{11}, W^{111}, and escapes by the burner Z^1, where it may be ignited.

The changing of the direction of the current dispenses, to a certain degree, with the labour required for stirring, with a spatula, the matters contained in the pipes; nevertheless, it is necessary, from time to time, to pass an iron rod or poker amongst the substances contained in the pipes. It is for this purpose that apertures are formed, so as to be easily opened and closed.

The patentee remarks, that although this operation is only described with reference to potash, for obtaining prussiate of potash, it is evident, that the same process is applicable to soda; and when the above-mentioned ingredients are employed, soda being substituted for potash, the result will be prussiate of soda.—[*Inrolled in the Rolls Chapel Office, July*, 1840.]

Specification drawn by Messrs. Newton and Son.

To FREDERICK HARLOW, *of Rotherhithe, in the county of Surrey, carpenter, for improvements in paving or covering roads and other surfaces, and in machinery for cutting the materials to be used for those purposes.*—[Sealed 9th February, 1842.]

THIS invention consists, firstly, in a mode of combining and sustaining the blocks of wood, used for paving roads and

ways, in order to prevent any individual block from sinking below the others; and secondly, in a machine for forming grooves in those blocks.

In Plate V., fig. 1, is a transverse section, and fig. 2, a longitudinal section of a pavement, having the first improvement applied thereto. In the sides of the blocks *a*, *a*, composing the pavement, grooves *b*, *b*, are made, to receive the tongues or rods *c*, *c*, which extend from one side of the road to the other, their ends entering grooves in the sides of the gutter-blocks. The two rows of gutter-blocks *d*, *d*, are combined, and caused to support each other, by a tongue *e*, proceeding in a longitudinal direction, or parallel to the line of road. The blocks *f*, *f*, that compose the foot-way, are combined, in like manner, by tongues or rods *g*.

If, at any time, a block is required to be removed, in consequence of a water-pipe bursting, or any similar occurrence, the block, represented in fig. 3, is substituted for it. This block is secured, in its place, by means of the tongues *h*, *h*, which are caused to enter the grooves *b*, *b*, in the sides of the two adjacent blocks, to the extent shewn by the dotted lines in fig. 3, by driving down the wedge *i*, until its upper end is level with the top of the block.

The machine, for forming the grooves *b*, *b*, in the sides of the blocks, and those that are required on the upper surface, to ensure a firm foot-hold for horses and other animals, is shewn, partly in section, in fig. 4,—figs. 5 and 6, being separate views of the rotary cutters, by which the grooves are made.

The grooving is effected by two circular metal plates or discs *j*, *k*, provided with suitable cutters, and mounted on the shaft *l*, to which motion is communicated by a band, from a steam-engine, or other prime mover, passing round the drum *m*. The disc *j*, by which the grooves *b*, *b*, are made, has two kinds of cutters; those marked *n*, *n*, forming the sides, and those marked *o*, completing the groove. The disc *k*, has only one kind of cutter *p*, which produces the angular grooves *q*, *q*, fig. 2.

The blocks are grooved, by placing them on the tables

or platforms *r*, *s*, in contact with the gauge surfaces *t*, *u*, and then moving them forward to meet the rotary cutters. The positions of the grooves are regulated by the gauge surfaces *t*, *u*, which are retained in any required situation by the screws and nuts *v*, *v*.

The patentee claims, Firstly.—The mode of applying tongues and grooves to combine and sustain the blocks of wood, used in paving roads and such like ways.

Secondly.—The mode of combining rotatory cutters *j*, *k*, with surfaces *r*, *s*, and gauge surfaces *t*, *u*, suitably for forming grooves, to receive tongues, in blocks used for wood pavements, and for forming grooves on the upper surfaces of the wood blocks, used for paving roads, as described.—[*Inrolled in the Inrolment Office, August*, 1842.]

To Edward François Joseph Duclos, *of Clyne Wood Works, Swansea, Gent., for improvements in the manufacture of sulphur, sulphuric acid, and sulphate of soda.*—[Sealed 11th July, 1839.]

The first part of this invention relates to the manufacture of sulphur, and consists, firstly, in producing it by mixing two parts of sulphuretted hydrogen gas, with one part of sulphurous acid gas, in a receiver, and then, by the injection of steam, condensing those gases, and causing them to combine and form sulphur; secondly, in making sulphur from pyrites, by roasting it in a retort, and conducting the vapour, arising from such roasting, into a reservoir of water, where it is condensed, and forms sulphur.

The second improvement consists in manufacturing sulphuric acid, by subjecting the pyrites, (after being operated on in the manner above mentioned,) in the retort, to calcination, until it is converted into persulphate of iron, completely deprived of its water of crystallization; then by a further process of distillation, highly concentrated sulphuric acid is obtained.

The third improvement consists in making sulphate of

soda, by mixing common salt and copperas together, in a pulverized state, and subjecting them, for three or four days, to a temperature of about from 80° to 100° Fahr.—At the end of this time, they are exposed to a red heat; by which means, hydrochloric acid is evolved, and peroxide of iron, and sulphate of soda, are obtained by solution.

The patentee claims, Firstly.—The mode of manufacturing sulphur from pyrites, as described.

Secondly.—The mode of manufacturing sulphur, by bringing sulphurous acid gas and sulphuretted hydrogen gas together, and, by their mutual decomposition, producing sulphur.

Thirdly.—The mode of manufacturing sulphuric acid, as herein described.

Fourthly.—The mode of manufacturing sulphate of soda, as herein described.—[*Inrolled in the Inrolment Office, January,* 1840.]

To Charles Payne, *of South Lambeth, in the county of Surrey, Gent., for improvements in salting animal matters.*—[Sealed 13th October, 1840.]

This improved mode of salting animal matters, consists in exhausting the air contained in meat, and then, by pressure, causing the brine to fill the cavities, previously occupied by the air.

The apparatus employed, for this purpose, consists of a strong air-tight vessel or receiver for containing the animal matters, connected with an air-pump, for exhausting the air, and a force-pump, for supplying brine. The receiver has a perforated false bottom, upon which the animal matters are laid, and above them a perforated false cover is placed, to prevent them from floating, when the vessel is filled with brine.

The mode of operation is as follows:—The receiver, by means of the air-pump, is first exhausted, and half filled with brine; the air-pump is then worked for a short period, and the brine admitted, until the animal matters are covered;

after which, the pump is set in motion to exhaust the remainder of the air, and the brine is forced into the receiver, by the force-pump, until it raises a safety-valve, loaded to form one hundred to one hundred and fifty pounds per inch. After the meat has remained under this pressure for a period, varying from fifteen minutes to an hour, the lid of the receiver is removed, and it is taken out. If preferred, the process may be carried on without creating a vacuum in the receiver.

The patentee claims the mode of salting animal matters, (which are preserved or cured by salt,) by causing the brine to penetrate into such animal matters, by means of pressure, or pressure and a vacuum, when such matters are contained in a suitably-closed vessel.—[*Inrolled in the Inrolment Office, April,* 1841.]

To EDWARD BROWN, *of Whiterock, near Swansea, in the county of Glamorgan, copper smelter, for a new principle, applied to the roasting and refining of copper.*—[Sealed 22nd June, 1839.]

THE patentee commences his specification by observing, that the usual process which the ore is required to undergo, in order that the copper may be separated from the impurities with which it is combined in the mineral state, are six in number, viz.,—first, calcining the ore; secondly, smelting the calcined ore; thirdly, calcining the coarse metal; fourthly, smelting the calcined metal; fifthly, roasting the metal; and sixthly, refining and toughening it.

The invention relates to the last two processes, and comes into operation when the coarse or blistered copper is in a state of fusion in the reverberatory furnace, covered by the slag or scoria, made in the process of roasting the metal.

Upon the fused metal, a flux is thrown, composed of equal parts of quick-lime and anthracite or other coal; or of equal parts of lime and wood charcoal, finely powdered. This is stirred in, by means of an iron rable, until the

scoria, which was previously of a red color, is changed into a black frothy mass; it is then skimmed off the surface of the metal, which is afterwards tapped into the sand-bed. The quantity of flux required, is from half a bushel to a bushel for each charge of metal.

The blistered copper is now put into the refining furnace, and further roasted and melted, until it becomes pure, and ready to undergo the improved toughening process, which consists in covering the surface of the metal with a mixture of equal parts of finely-sifted lime and pulverized wood charcoal, or of lime and saw-dust, or lime and anthracite coal, coarsely powdered, (polling the metal as usual,) the quantity required, at the commencement of the polling, being about three Winchester bushels; an addition is afterwards made, if necessary, in order to preserve the surface of the metal from exposure to the air that passes through the furnace. By this process, the remaining portion of sulphur and other impurities, which are inseparable from the copper by the ordinary method, are effectually removed, and the metal becomes highly ductile and malleable.

The patentee claims the application or use of any portion of lime, in combination with any other matters or substances whatsoever, in roasting or in refining copper ores. —[*Inrolled in the Inrolment Office, December,* 1839.]

To THOMAS CLARK, *Professor of Chemistry in Mareschal College, University of Aberdeen, for a new mode of rendering certain waters (the water of the Thames being amongst the number) less impure and less hard, for the supply and use of manufactories, villages, towns, and cities.*—[Sealed 8th March, 1841.]

THIS invention consists in purifying and softening water, by mixing lime-water therewith, in suitable proportions, and then, by subsidence alone, or by subsidence and filtration, separating the precipitate consequent on the mixture.

The waters which this invention can be used for purify-

ing and softening, are those that, in the first place, will indicate an alkaline action, on being tested by reddened litmus paper; secondly, being boiled, for two hours, in a glass vessel, and the greater part of the steam allowed to condense, will deposit a powder, soluble with effervescence in muriatic acid; and thirdly, will be softened, by such boiling, to an extent that is material for practical purposes.

The degree of softening may be ascertained by weighing the water, and the vessel containing it, previous to boiling, and weighing them again after the boiling and subsequent cooling, replacing, with distilled water, any loss that may have occurred in the form of steam; then, if the hardness of the water that has been boiled, and of the water in its original state, is measured, the difference between them will shew the amount of softening the water has undergone.

The patentee measures the hardness and alkaline property of the water, and ascertains if any caustic alkaline or earthy matter is dissolved in it, by means of a number of chemical agents, tests, and standard solutions, which do not, of themselves, constitute a part of this invention.

The general rule of ascertaining the proportion of lime-water requisite to be used with the water to be purified, is to measure the alkalinity of both waters, and use them in the inverse proportion of their respective degrees of alkalinity; thus, if the alkalinity of the lime-water is sixteen times greater than that of the unpurified water, one measure of the former is used to every sixteen measures of the latter.—[*Inrolled in the Inrolment Office, September*, 1841.]

To Thomas William Booker, *of Melin Griffith's Works, near Cardiff, iron-master, for improvements in the manufacture of iron.*—[Sealed 22nd February, 1841.]

These improvements consist in accelerating the operation of converting cast-iron into malleable iron. It consists in running off the metal, in a fluid state, after the refining process is complete, from the refinery into the puddling furnace, through a passage that connects the two furnaces. The metal is then puddled, and divided into lumps or

balls, as usual, in readiness for passing between the rolling cylinders, or other apparatus used for compressing or forging the iron.—[*Inrolled in the Inrolment Office, August,* 1841.]

To William Hutchinson, *of Sutton-on-Trent, Nottinghamshire, seed-crusher and oil-cake manufacturer, for certain improvements in the manufacture of oil-cake or seed-cake.*—[Sealed 5th April, 1841.]

These improvements consist in making oil-cake of linseed, mixed with barley, wheat, peas, beans, or other grain or pulse.

The barley, &c. is first riddled, to free it from any rubbish that may be mixed with it, and is then ground into meal. Twelve quarters of this meal are mixed with nine quarters of crushed linseed, and ground under vertical stones into a fine flour, which is then put into a kettle, and heated by steam to 212° Fahr. It is removed from the kettle, while in this hot state, into an ordinary stamper press, in which all the superfluous oil from the linseed, that is not taken up by the barley or other grain, is expressed, and the making of the oil-cake finished.

The patentee claims the manufacture of oil-cakes, by the admixture, with linseed, of barley, wheat, oats, peas, beans, tares, or other grain or pulse, in or about the proportions, and in the manner above described.—[*Inrolled in the Inrolment Office, August,* 1841.]

Original Paper.

ON DREDGE'S SUSPENSION BRIDGE.

By Mr. W. TURNBULL.

Amongst the numerous improvements that have been made in the different branches of mechanical science within the last few years, that which has reference to the construction of suspension bridges is one of the most important. It had long been observed,

that when a bridge is erected on the principles of the common Catenary, there is a much greater quantity of material employed than is absolutely required for strength, and that the surplus materials, instead of being advantageous to the stability of the structure, is conducive to a positive injury. In consequence of this, a great many attempts have been made by different skilful and experienced individuals, to introduce some variation, either in the form of the chains themselves, or in the mode of connecting them; but not one of the numerous schemes that had been suggested, was found of sufficient consequence to supersede the original plan, until Mr. Dredge of Bath was led to the discovery of the tapering chain and the obliquesu spending-rods,—a discovery which he first promulgated in the year 1836,* and shortly afterwards he had the opportunity of testing its utility, by the erection of the Victoria Bridge across the river Avon, in Somersetshire. Since that period, the subject has been discussed by almost every learned society in Europe and America, and is, even now engaging the attention of philosophers beyond the GANGES.

Mr. Dredge's invention, like every other bold and original scheme, has experienced much opposition; and what is not a little singular, those very individuals who ought to have rallied in support of it, have been its most inveterate and strenuous opponents; and they still continue to manifest their opposition to its adoption, by pertinaciously adhering to the absurd and self-destroying form of the Catenarian curve.

This curve, as is well known, is formed by a perfectly flexible chain or rope, of uniform figure and density, which hangs freely suspended between two fixed points, in a vertical plane. It is therefore manifest, from the very nature of the description, that the material of which the curve is composed, is self-destructive in a state of suspension, although in a reverse position, the weight would be conducive to stability. It matters not of what material the chain is constituted, provided it be uniform and perfectly flexible; for a chain, of the same length, whether it be made of

* For Specification of this Patent, see Vol. XI. p. 1, of our present Series.

of gold or of gossamer, will form itself into precisely the same curve, and must consequently, be governed by the same laws of tension and gravity, according to the density of the substance employed in its composition.

Since every small element of the Catenarian chain is of the same weight, it is evident that the tension at each inferior point, must be less than that at the point immediately above it, so that, in strictness, the tension excited in the chain by means of its own weight, varies regularly from the points of suspension where it is greatest, to the lowest point or vertex of the curve where it is the least. It was the attentive consideration of this circumstance, that led Mr. Dredge to the discovery of the tapering chain, and a minute examination of the laws of nature, in forming the bones and ribs of animals, and the branches and leaves of plants, suggested the idea of the diagonal rods.

It would be utterly impossible in the construction of a bridge, to taper the chain in the same regular order that the diminution of tension indicates; it is therefore, the practice of the inventor, to make the chain of sufficient strength at the bases or points of support, by putting the requisite number of bars in the first links adjacent to the towers, and to diminish the number by one in each successive link, until it terminates in a single bar at the middle of the bridge. In this way he avoids the difficulty of the gradual taper, and the principle is notwithstanding, as closely imitated as the most delicate case of practice can ever require.

In consequence of a letter from the Right Honourable Lord Western to Lord Viscount Melbourne, then at the head of Her Majesty's Government, the Commissioners of Woods and Forests have been induced to notice the subject, and under their directions, five bridges on the principles of the tapering chain, have been erected in the Regent's Park, two of them 75 feet span each, over the canal at the extremities of the Zoological Gardens, and three in the interior of the park, across the ornamental waters, the largest of which has a span of 150 feet. These bridges are highly convenient for opening communications between different parts of the public promenades, and with a little attention to the

workmanship, would have furnished splendid examples of the justness of the principle which Mr. Dredge has had the good fortune to introduce to public notice.

In the course of last winter, (1842,) a bridge of large dimensions for general traffic, was thrown across the river Leven in Dumbartonshire North Briton; this bridge is 200 feet in span and 20 feet wide, with 92 feet of reverse curvature, or 46 feet on each side of the river, making in all 292 feet of suspended roadway.

The chains were begun about the beginning of January, and it was opened to the public on the 22nd of the following month, having occupied a period of seven weeks, and for the most part of very stormy and inclement weather.

The specimens now executed on this principle, are quite sufficient to prove its superiority over the old system of Catenarian practice; and we hope to hear no more of those objections to its general adoption that have been thrown out by those who, to all appearance, have suffered their minds to become stultified by sheer envy. The Continental Engineers are more liberal than those of our own country, and the inventor is daily receiving testimonials from men of the highest eminence, that cannot fail to prove extremely gratifying to his feelings.

The grand secret of the invention lies, in transmitting the strain through the road-way, to the points of suspension, by means of the oblique diagonal bars,—and this is the very thing that has elicited the strongest opposition. The tapering of the chain is admitted to be only what the nature of the curve suggests, but the obliquity of the suspending-rods is still affirmed, by men of no mean pretensions, to be totally subversive of every mechanical law, although the soundness of the principle has been attested by the immutable evidences of mathematical demonstration.

The design of what follows, is to give the general reader some idea of the mathematical principles upon which the merit of the invention rests; and to this end, it has been deemed expedient to introduce the subject with the simplest cases of tension, as in this way, the mind will be gradually prepared to receive the im-

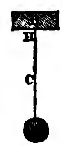
portant truth, which terminates in the formation of the tapering chain.

Proposition 1.—The direct tension of any string, cord, or chain, in whatsoever manner it may be produced:—

> *Is measured by that weight or force which will stretch it just as much, being applied at one extremity of the cord or chain, and sustained by it, while the cord itself is sustained at rest in a vertical position by the other extremity.*

This is obviously the simplest case in which the tension of a cord can be exhibited, and the import of the proposition will be readily gathered from the following illustration:—

Fig. 1.



Let B, fig. 1, represent a block of wood, stone, or any other immoveable object, so posited as to admit a cord or chain to hang freely in a direction perpendicular to the horizon. Into this block is fixed a hook or staple, at H, and from this hook a cord c is suspended, having a weight *w* attached to the lower extremity.

Now, since the cord c, is suffered to hang freely from the hook at H, and by its tenacity, to support the weight *w*, acting in the direction of gravity, it must be stretched by a force, the intensity of which is equivalent to the weight applied to it; therefore, by whatever name, or in whatever manner, the straining force is expressed, it is said to be the measure of the tension excited in the cord c.

Thus, if the magnitude or value of the weight *w*, be expressed in tons, the tension of the cord c, is said to be equivalent to as many tons as are contained in the weight that stretches it, the weight being always supposed to act in the direction of gravity.

Proposition 2.—If a string, cord, or chain, be no where attached to any thing but at its extremities:—

> *The tension produced by any force acting upon it, will be the same at every point in its length, disregarding the effect produced by its own gravity or weight.*

The truth of what is here enunciated, is manifest from the

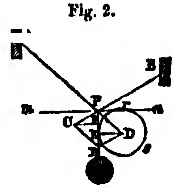
drawing, fig. 1; for the action of the weight *w*, on the cord c, is precisely the same as the re-action of the block B, in an opposite direction; and, consequently, since the action of the weight *w*, is transmitted to the block B, through the medium of the cord c, it follows, that every part of the communicating cord must sustain a tension equal to the weight *w*.

These two propositions involve the fundamental principles of tension; and the variations that are shown to exist in different systems, can only be obtained in consequence of a difference in position, or in the direction of the force by which the tension is produced.

PROPOSITION 3.—If a cord or chain be fastened by its extremities to two immoveable objects, and stretched by a weight applied at any point in it:—

> *The tensions on the two portions of the cord, between the weight and the points of suspension, are proportional to the secants of the angles which their directions make with the plane of the horizon.*

Fig. 2.



Let A P B, fig. 2, be a cord, fastened by its extremities to the immoveable objects A, and B, and let *w*, be a weight, suspended at the point P, through the point P, at which the weight is applied; draw the straight line *m n*, perpendicular to P R, and consequently parallel to the horizon; then, by the proposition, the tension in A P, is to the tension in B P, as the secant of the angle A P *m*, is to the secant of the angle B P *n*, these being respectively the angles which the directions of the cords A P, and B P, make with the horizon *m n*.

In the straight line P R, which marks the direction of the straining force, let P R, be assumed as the linear representative of the weight *w*; produce A P, and B P, the opposite portions of the sustaining cord, and upon P R, as a diagonal, describe the parallelogram P C R D; then is P D, the tension on the cord A P, and P C, or its equal D R, the tension on B P. Therefore, the weight *w*, and the tensions on A P, and B P, the opposite portions of the sustaining cord, are to each other, respectively, as P R, P D,

and R D, the sides of the triangle P D R, which, by the writers on mechanics, is denominated the *triangle of forces.*

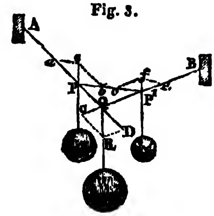
Let P D, and P C, the linear equivalents of the tensions in A P, and B P, be resolved into the two forces P E, D E, and P F, D F, of which P E, and P F, are perpendicular, and D E, C F, parallel to the horizon; then, since P C R D, is a parallelogram, the forces D E, and C F, are equal to each other, but lying in opposite directions with respect to the vertical line P R, they destroy each other's effects, and thereby annihilate the horizontal force.

Since D F, is parallel to the straight line *m n*, the angles P D E, and R D E, are respectively equal to A P *m*, and B P *n*; therefore, if D E, be made the radius of the circle E *r s*, the tensions P D, and R D, become the secants of the angles P D E, and R D E, to that radius; so that, according to the proposition, the tensions in the opposite portions of the sustaining cord, are to one another, as the secants of the angles which their directions make with a straight line, drawn parallel to the plane of the horizon.

PROPOSITION 4.—If a cord or chain be fastened by its extremities to two immoveable objects, and stretched by two weights, applied at different points in it:—

The tensions in the extreme portions of the cord, are precisely the same as they would be, if a single weight equivalent to the sum of both, were applied at the point where the extended directions of the cords would intersect each other.

Fig. 3.



Let the cord A P P^1 B, fig, 3, be fastened by its extremities to the immoveable objects at A, and B, and let the weights *w*, and *w*^{1}, be suspended from the points P, and P^1. Produce A P, and B P^1, the extreme portions of the cord, until they meet each other in the point Q; then, if the weight W, equal to the sum of the two weights *w*, and *w*1, be suspended from the point Q, the tensions in A P, and B P1, will be precisely the same as when the weights are applied separately at the points P, and P^1. This is a very beautiful property, and furnishes the ground-work of the theory of tension. Since the

weights *w* and w^1, exert themselves in the directions of gravity, let the lines, in which they act, be produced upwards in a contrary direction, and let P *e*, be taken, of any convenient length, at pleasure, to represent the measure of the weight applied at P; then, on P *e*, as a diagonal, construct the parallelogram P *a e b*, and P *a*, will be the measure of the tension in the cord A P, while P *b*, is the tension in the middle part P P^1.

Now, when the cord is strained by the two weights *w*, and w^1, acting at the points P, and P^1, the middle portion P P^1, is manifestly in the same condition as if it were fastened at P, and P^1, under the same degree of tension; therefore, by proposition 2, whatever tension is produced at P, in the direction P P^1, the same is produced at P^1, in the direction P^1 P; hence the following construction:—

Upon P^1 P, the middle portion of the cord, set off P^1 *c*, equal to P *b*, and through the point *c*, draw *c f*, parallel to P^1 B, and meeting P^1 *f*, in *f*; complete the parallelogram P^1 *c f d*, and P^1 *d*, will be the measure of the tension in the portion B P^1; and P^1 F, that of the weight w^1, in the direction of gravity.

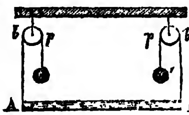
Make Q R, equal to the sum of P *e*, and P^1 *f*, and produce A Q, and B Q, beyond the point of intersection to D, and C; then, upon Q R, as a diagonal, describe the parallelogram Q C R D; then is Q D, the measure of the tension in the cord A Q, and Q C, the measure of that in B Q. But Q D, is equal to P *a*, and Q C to P^1 *d*, as will readily be perceived by those who are acquainted with the elements of geometry; therefore, the tension at A, and B, is precisely the same, whether it be produced by the two weights *w*, and w^1, acting separately at the points P, and P^1, or by the single weight W, equivalent to their sum, acting at the point Q.

If another weight were added at a separate point in the cord, and the whole system left to the action of its own gravity, the result would still be the same; and if ever so many weights were applied at different points in the cord, the tension on the extreme portions would be precisely the same as if a single weight equivalent to their sum, were applied at the intersection of their directions. By this law, therefore, the tension in the chains of a suspension bridge can easily be found.

PROPOSITION 5.—If a heavy bar, of uniform figure and density throughout its length, be supported horizontally by two equal forces acting at its extremities in a vertical direction, or perpendicular to the horizon:—

The cords, on which the forces act, will be equally stretched in all their parts, and each of the forces will sustain an equal portion of the weight of the bar.

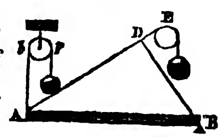
Fig. 4.



Let A B, fig. 4, be a straight inflexible rod or bar, of uniform figure and density, supported in a horizontal position by the two equal weights w, and w^1, attached to the cords $p\ b$ A, and $p\ b$ B, passing over the pullies p, and p, in such a manner, that the portions b A, and b B, shall be perpendicular to the horizon, and consequently parallel to each other. Then, since the cords are no where attached to any object but at their extremities, and because the weights w, and w^1, are equal between themselves, it follows, that the cords are equally stretched in all their parts, and each of them sustains one-half the weight of the bar A B, the tension on each cord being measured by the weight w, in whatever manner it may be expressed.

But if, instead of having two cords and two equal weights attached to the bar A B, we conceive one cord and one of the weights to be withdrawn, and in their stead, to have a solid immoveable prop or fulcrum, supporting the extremity B, as represented in fig. 5, while the other extremity A, is supported by the weight and cord as before,—then it is manifest, that half of the bar is supported by the fulcrum at B, and the other half by the weight w, the tension in every part of the cord being the same as in the preceding case.

Fig. 5

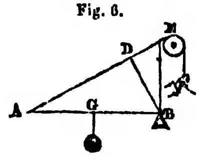


If the direction of the cord should be inclined to the horizon, in an angle B A E, then the tension on the cord A E, is no longer represented by the weight w, nor is the pressure on the fulcrum B, equivalent to half the weight of the bar; for, in consequence of the oblique direction of the cord, there must be a force excited in the bar, in the direction of its length, so that some ob-

stacle is required beyond the fulcrum, to prevent the bar from being urged in that direction by the weight w, acting obliquely at A, the other extremity. The bar is now sustained by three forces, namely, the pressure on the fulcrum at B, exerted vertically, the thrust on the obstacle beyond B, exerted horizontally, and the oblique force in the direction A E. From the fulcrum B, draw the straight line B D, perpendicular to A E, the direction in which the weight acts; then is B D, the leverage which produces the tension in the cord A E.

Let us now suppose that the weight of the bar is accumulated at its centre of gravity, as in fig. 6, where the weight is represented by W, suspended from the middle of the length. This is a supposition perfectly admissible in mechanics, and is often resorted to for the purpose of simplifying the investigations, the absolute effect, in that case, being precisely the same as that which is produced by the bar in its natural state.

Fig. 6.



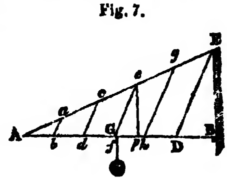
Then, since B D, is perpendicular to A E, the magnitude of the power, which, acting in the direction A E, sustains the system in a state of equilibrium, is found by the following proportion, viz:—

$$BD : GB :: W : p = \frac{GB \times W}{BD}.$$

But, by the principles of plane trigonometry, the perpendicular B D, is equal to A B × sin. $\angle$ B A D, and, by the nature of the question, B G $= \frac{1}{2}$ A B; therefore, by substitution, it is $p = \frac{\frac{1}{2} AB \times W}{AB \times \sin. \angle BAD} = \frac{1}{2}$ W cosec. $\angle$ B A D. These then, are the principles by which the tensions in the different parts of the chain are to be calculated, and it has now to be shewn, that the tensions decrease from the base to the middle of the bridge, the strain being taken up in succession by the oblique suspending rods.

Let A B, fig. 7, be a bracket, abutting against the wall E B, or what is the same thing, let it be supposed to represent half the platform or road-way of a suspension bridge, and let A E, be the sustaining chain, (it is of no consequence whether it be considered as a straight line or a curve, for the

Fig. 7.



principle is the same on both suppositions); then it is obvious, that the platform A B, is sustained in the horizontal position by a tension in the chain A E, and a compression in the direction A B.

It is further evident, that in whatever manner the tension is transmitted to the point of support at E, it must always be of the same intensity at that point, while the weight of the platform remains the same; but the weight of the platform is constant, consequently the tension, on the point E, is constant also.

Now, let *g h*, *e f*, *c d*, and *a b*, be four oblique bars, attached to the chain at the points *g*, *e*, *c*, and *a*, and the platform at the points *h*, *f*, *d*, and *b*, and let these bars be brought to the proper degree of tension, in order to transmit the proportional weights of the platform to the chain at their respective points of junction. Then, if we suppose only one of them as *g h*, to act at the same time with the force in the direction of the chain, it is clear that the tension on *g* E, that part of the chain contained between the point of support, and the point where the bar is attached, must be equal to the tension in A *g*, the lower part of the chain, and of that in the bar *g h*; that is, the tensions in A *g*, and *g h*, are, together equal to the tension in *g* E, so that the strain on A *g*, being less than that on *g* E, it may be made of less dimensions.

Again, let another bar *e f*, be brought into action at the same time with *g h*, then the tension on *g e*, is equal to both the tensions on A *e*, and *e f*, so that *e c*, may be made of less dimensions than *g e*, the tensions on *e c*, *e f*, and *g h*, being, together, equal to the constant tension on *g* E.

If another bar *c d*, be brought into action at the same time with *g h*, *e f*, and A E, then the tension on A C, will be still more diminished, and of course, so may the dimensions, for the total constant strain is now transmitted through the lower part of the chain A C, and the three oblique bars *c d*, *e f*, and *g h*. Pursuing this mode of reasoning to any number of subsidiary bars, it will be found that the tension on the lower portions of the chain continually diminishes, a proportional part of it being taken up by each successive bar, so that at the centre of the bridge, where the position of the bars is reversed, the strain upon the chain is evanescent.

This, then, is the principle of Mr. Dredge's bridge, in as far as the tapering of the chain is concerned; and a further advantage is gained by the obliquity of the suspending-bars, as well as by the curvature or deflection of the chains.

That part of the advantage which is gained by the obliquity of the suspending-rods, has a direct reference to the action of the lever; for let *e p*, fig. 7, be a perpendicular upon the platform A B, and suppose it to be attached to the same point of the chain as the oblique rod *e f*, then, since each of the suspending-rods, throughout the system, must support its own portion of the roadway, it is obvious that the portion B *f*, between the fulcrum at B, and the point of attachment at *f*, will be more easily supported, by a force acting in the direction *e f*, than by the vertical force acting in the direction *e p*; not only because the oblique force acts at a greater distance from the fulcrum, but also in consequence of a thrust against the abutment at B, which does not obtain by the action of the vertical force.

With respect to the position of the suspending-bars, it has only to be observed, that the distance B D, must be fixed upon, according to the deflection of the chain and span of the arch, and the remaining part A D, is then divided into as many equal parts as there are links in the chain; so that, if the chain were a straight line, as A E, all the bars would be parallel to each other, making equal angles with the platform; but in consequence of the flexure of the chain, they deviate a little from the parallelism, in proportion to their respective distances from the points of suspension at E. This deviation, however, being a variable quantity, cannot be ascertained without applying the calculus of variables; but, in general, its quantity is so small, as to produce no appreciable effect upon the results. Indeed, the inventor erects all his bridges on the supposition of parallel bars; for, in this way, whatever deviation may occur from the results of theory, will always be found to lean to the side of safety.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 67, Vol. XXI.)

March 8, 1842.

The PRESIDENT in the Chair.

"Description of the Tanks for Kyanizing the Timber for the permanent way of the Hull and Selby Railway."

By John Timperley.

Upon the recommendation of Messrs. Walker and Burges, the Engineers, it was determined that the sleepers of this railway should be kyanized in close vessels, using exhaustion and pressure, instead of in the open tanks usually employed. The present communication, which includes a description of the kyanizing vessels, and an account of the various circumstances connected with the operation, commences by describing the apparatus, as shown by the accompanying drawing, to consist of two tanks, a reservoir, two force pumps, and a double air pump. The tanks are cylindrical, with flat ends, and are made of wrought-iron plates, nearly half an inch in thickness; they are 70 feet in length, and 6 feet in diameter: at each extremity is a cast-iron door, flat on the outside, and concave on the inner side, provided with balance weights for raising and lowering it. Each end is strengthened by five parallel cast-iron girders, whose extremities are held by wrought-iron straps, riveted on to the circumference of the tanks. Notwithstanding the great strength of these girders, several were broken by the pressure applied during the process. The vessels are lined with felt, upon which is laid a covering of close jointed fir battens, fastened with copper rivets; this precaution is necessary to prevent the mutual deterioration which would arise from the contact of the iron and corrosive sublimate. There was originally only one brass force pump, 2 inches diameter, and 6 inches stroke; this being found insufficient, another was added of 4 inches diameter, and henceforward a pressure of 100 lbs. per square inch was easily obtained. The air pump is

10 inches diameter, and 15 inches stroke. Its construction is of the ordinary kind. The author gives, in an appendix to the paper, a minute description of the various parts of the apparatus, with the details of their dimensions and weight. The process is simple and rapid; the corrosive sublimate is first mixed with warm water in a trough, in the proportion of 1 lb. of the former to 2 gallons of the latter; the clear solution is then poured off into the reservoir, where water is added till it is diluted to the proper point, which may be ascertained by a hydrometer; a more perfect test is the action of the solution upon silver, which it turns brown at the requisite degree of saturation. The operations of exhaustion and pressure, employ eight men for five hours, the whole process occupying about seven hours, during which time from 17 to 20 loads are kyanized in each tank. It is desirable that the timber should remain stacked for two or three weeks after kyanizing, before it is used. It was found that about ¾ lb. of corrosive sublimate sufficed to prepare one load (50 cubic feet) of timber. About 337,000 cubic feet of timber were kyanized, the average expense of which, including part of the first cost of the tanks, was about *5d.* per cube foot. The timber was tested after the process, and it was found that the solution had penetrated to the heart of the logs.

The paper contains some interesting tables, exhibiting the quantity of solution taken up by different kinds of wood with and without exhaustion; from these it appears that the saturation per cube foot, in the latter case, did not exceed 2·25 lbs. with specimens of Dantzic timber, whereas it ranged between 12·24 lbs. and 15·25 lbs. with pieces of home-grown wood. The author observes that this striking difference may be partly due to the greater compactness of the foreign timber.

Appended to this communication is a correspondence between Mr. J. G. Lynde and Mr. James Simpson, relative to the best tests of the presence of corrosive sublimate, accompanied by letters from Mr. Colthurst and Dr. Reid; the former of these describes the process of kyanizing adopted on the Great Western Railway, and the latter suggests the three following tests; 1st,

Dilute hydro-sulphuret of ammonia; 2nd, A strong solution of potassa; dilute nitric acid and proto-muriate of tin, also gold-leaf with this solution; and 3rd, Iodide of potassium. Directions are given for the application of these tests.

Mr. Lynde also mentions the use of a solution of nitric acid, and by the application of hydriodate of potash, detecting the presence of mercury in a specimen taken from the heart of a log of timber 10 inches by 5 inches and 9 feet long. He also details appearances of the destructive action of the corrosive sublimate upon the iron-work with which it came into contact, which would be prejudicial to the use of iron bolts in kyanized sleepers.

A drawing, explanatory of the whole apparatus, accompanied the communication.

In answer to questions relative to the process of exhausting the air from the receiver in which the bank-note paper was wetted at the Banks of England and Ireland previously to being printed, Mr. Oldham stated that as an experiment a packet of 1000 sheets of paper had remained a whole day in water without being wetted through: whereas, by exhausting the air from the vessel containing them, to a partial vacuum of 22 inches of the barometer, and admitting water, they had been perfectly saturated in five minutes; the edges of the paper in simple immersion, would rot away before the mass was saturated; by the exhausting process 5,000 sheets of bank-note paper would absorb 16 lbs. of water.

Mr. Simpson conceived that exhaustion would facilitate the process of kyanizing; but he believed that if time was allowed pressure would accomplish the same end as perfectly, for he had observed that pieces of wood which had remained four or five days in a water-main, under pressure, had become perfectly saturated. Captain Scoresby, in his account of the whale-fishery, remarks, that when a whale carries a boat down, it rarely rises again, most probably because the fish plunges to such a depth that the extreme pressure water-logs the boat: instances had been known of the specific gravity of the planking being doubled by being carried down.

Mr. Newton remarked, that immersion of timber in close tanks had been practised by Mr. Langton many years since, for bending timber: a boiling fluid was used in the tanks, and the wood was subjected to heat for a considerable period. He had understood that Mr. Newmarch of Cheltenham, was the first person who used corrosive sublimate for preserving timber, and that he had prepared and employed considerable quantities of wood. Mr. Kyan subsequently revived the system.

In Mr. Oldham's process of wetting paper, pressure was not requisite on account of its open texture. About the year 1819, Mr. Oldham had tried the same process with perfect success, for preserving meat.

Exhaustion had been tried by Mr. Harris, for cleansing wool. The cops of wool were put into an exhausted receiver, a solution of an alkali was then admitted; after remaining a short time in the liquid, a sufficient quantity of diluted acid was added to neutralize the alkali, and the wool was washed out in clean water. The process succeeded perfectly, but was too expensive.

Mr. Palmer had employed the kyanizing process for large pieces of timber, for the ribs of lock-gates, but had no means of ascertaining the depth to which the mercury had penetrated. The use of corrosive sublimate was first suggested by Sir H. Davy, in his lectures at the Royal Institution, as a means of destroying the vegetating process in timber, by the combination of the chlorine in the former, with the albumen of the latter. Mr. Palmer much doubted whether the means used for exhausting the capillary tubes, effected the object, unless the timber was in a dry state, and he considered it equally doubtful whether the solution could be forced to any considerable depth by compression, especially if any moisture actually filled the capillary tubes. The application of pressure in the process of salting meat, suggested by Mr. Perkins many years ago, was a complete failure.

Mr. Simpson observed that, in the experiments of Messrs. Donkin and Bramah, pressure alone had been used, and it could easily be understood, that owing to the cellular formation of meat, the pressure, instead of forcing the salt through it, caused

the substance to collapse, and the brine was prevented from penetrating.

Mr. Braithwaite explained, that in Payne and Elmore's process, although pressure had been found indespensable, the meat was more perfectly prepared when exhaustion was also employed, therefore both were now combined.

Mr. May reverted to the subject of kyanizing timber,—he believed that exhausting the air from the tanks, previously to the admission of the solution, was a loss of time—the fluid should be admitted first, or at least while the exhaustion was proceeding; labour and time would thus be saved, and the air would be more completely expelled from the capillary tubes, before pressure was applied. It was essential that the timber should be, as far as possible, deprived of its sap as well as dried; as either sap or moisture appeared to prevent the proper action of the corrosive sublimate.

Mr. Cubitt regretted that experiments had not been made on the same kinds of wood, both with and without exhaustion. The experiments on small pieces of foreign (Memel and Dantzic) timber, with 80 lbs. to 100 lbs. pressure, without exhaustion, showed an increase of weight of from $1\frac{1}{2}$ to 2 oz., in pieces of about $\frac{1}{40}$th part the size of a sleeper, and that result agreed very nearly with his practice with sleepers of Memel and Dantzic timber, when kyanized without exhaustion, under a pressure of 80 lbs. to the inch; sleepers of $2\frac{1}{2}$ to $2\frac{3}{4}$ cube feet, gaining from 3 lbs. to 5 lbs. in weight, by the process. No result had been given of experiments with sleepers of foreign fir timber, in which both exhaustion and pressure had been applied; but it appeared that the Scotch fir sleepers, weighing 100 lbs., when kyanized under exhaustion and a pressure of 100 lbs. to the inch, gained 33 per cent. in weight, which was equal to 3 gallons of water being forced into less than 3 cube feet of timber; he thought that this difference could not be all due to exhaustion, but that it must depend greatly upon the quality of the wood, because under a pressure of 100 lbs. to the inch, the air contained in a tubular substance (such as fir timber) would all be compressed into

about $\frac{1}{8}$th of its natural bulk, without previous exhaustion; so that the difference between 5 lbs. and 30 lbs. forced into a sleeper, could not, he thought, be all due to exhaustion, but must depend upon other circumstances, not explained in this paper.

The President thought that the greater degree of absorption by the Scotch fir, might be accounted for by its open texture, whereas the foreign timber was more compact, and also contained more turpentine. It might also have been wetter than the Scotch fir, which he believed had been the case.

Mr. Taylor observed, that hitherto the attention of the meeting had been entirely directed to mechanical action, but that the chemical combination of the corrosive sublimate with the albumen of the wood, was the point most insisted upon by Kyan; it was supposed to be similar to the operation of tanning hides, in which the tannin of the bark combined with and saturated the animal gelatine, which would not otherwise be permeable by the fluid in which it was placed.

Lieut. Oldfield suggested that if the timber, when piled in the tank, was subjected to the action of heat, at 212°, the moisture contained in the capillary tubes would be expelled in the form of steam, and that on the admission of the solution, the tubes would instantly be filled with it, because of the partial vacuum formed in them.

Mr. Colthurst observed, with regard to the tests for ascertaining the amount of saturation of the timber, that he had tried all those described by Mr. Lynde, and had not been able to discover the presence of mercury in the heart of any of the timbers prepared for the Great Western Railway; their dimensions were 6 inches by 12 inches; Dr. Faraday had, he believed, detected it, by the aid of the galvanic battery, in the heart of a piece of timber 2 feet square, after simple immersion in the solution for fourteen days.

Mr. Moss had tried many experiments as to the most delicate tests for ascertaining the depth to which the mercury had penetrated; the most satisfactory test was gold-leaf, as from its strong affinity for mercury, the presence of the latter was im-

mediately detected. The mode of proceeding, was to put some fibres of the wood to be tested into a small test tube, mixed with a portion of dry carbonate of soda; then, to place over, but not in contact with it, a small piece of gold-leaf, and apply heat to the bottom of the tube. If any mercury was present, in however small a quantity, the fumes would rise and discolour the gold-leaf.

Mr. W. Cubitt said, that timber was at all times, more or less, charged with moisture: he had found deals, supposed to be dry, lose 10 per cent. of their weight from steam drying; it was evident, that the presence of moisture in the pores of the wood, must militate against the success of kyanizing by simple immersion, unless it was continued for a very long period. In close tanks, when exhaustion and pressure were resorted to, the moisture was perhaps of less importance, but still, if the sap was extracted, and the timber previously dried, the process of kyanizing would be more efficient.

Mr. S. Seaward adopted Mr. Palmer's position, as to the almost impossibility of forcing the solution through the capillary tubes of a long piece of timber, the pressure being applied equally all over the surface: he believed the present method of kyanizing to be very imperfect, and alluded to a number of sleepers so prepared for the West India Dock warehouses, having been recently discovered to be decayed.

Mr. Martin confirmed this account of the decay of the sleepers: fifty out of seventy were destroyed; they had been prepared by simple immersion, and had been down about five years. He had understood that some of the wooden tanks, in which the solution was kept at the Anti-Dry-Rot Company's yard, were decayed.

Mr. C. May believed, that the destruction of the tanks might have arisen from the constant corrosive action of the mercury, and not from decay. The capillary vessels of timber being filled with air and sap, under exhaustion, the air would expand and drive before it a considerable portion of the sap and moisture. In preparing the compressed trenails and wedges, he used steam, and found that the pores were opened by it;—he suggested that

steam should be blown through the tanks until all the timber in them was raised to a certain temperature, and then, by opening the communication wtth the reservoir, the solution would rush in and fill up the vacuum.

Mr. Cowper believed, that it was only necessary to bring the chlorine of the corrosive sublimate and the albumen of the timber into contact, when sufficiently dry, to insure the preservation of the wood. He had occasion to try experiments with paper pulp, and was constantly annoyed by its decaying—but the addition of a small quantity of chlorine had preserved it good for two years, and he believed that it would continue unchanged.

General Pasley confirmed the statement as to the increase of the specific gravity of timber from long immersion at considerable depths. He had found all the timber, except the mainmast, in the Royal George, at a depth of about 90 feet, water-logged. The oak timber had increased, on an average, more than 50 per cent. above its usual specific gravity.

Mr. F. Braithwaite remarked upon the doubt which appeared to exist among members as to the correctness of that part of Mr. Timperley's Paper, where a sleeper, containing 3 cubic feet of timber, was reported to have increased 30 lbs. in weight. Mr. Braithwaite had made some experiments, the results of which showed that a piece of Memel timber, containing 533 cubic inches, and weighing, when dry, 9 lbs., became double its weight when subjected to a pressure of about 320 lbs. per square inch, without previous exhaustion; the machine which he used, not being provided with an air-pump. A smaller piece of American pine, containing 76 cubic inches, and weighing 1 lb. 7 oz., increased in weight 3 lbs. under a similar pressure,—this he contended established the correctness of Mr. Timperley's Report.

There appeared also to be a misconception as to the amount of corrosive sublimate employed,—the Paper states that ¾ lb. was the quantity used for each load of timber of 50 cubic feet.

He promised to make some further experiments, and report them to a future meeting.

Mr. Bull had prepared considerable quantities of boards for

the Calder and Hebble Navigation, by immersing them in the solution for two or three days, which was about double the period allowed by the patentees. He had some specimens of the boards, and in almost all of them there was an appearance of decay in various stages. An oak board, 1 inch thick, kyanized in 1839, had lain ever since upon the damp ground, exposed to the air: the sap part was entirely decayed, but the heart remained sound; fungus was however growing upon it. Poplar boards, kyanized in 1838, 39, and 40, were all partially decayed—those which were not prepared, and had been exposed in the same situation for the same period, showed however more symptoms of decay. In preparing the timber, heh ad always followed the instructions of the patentees, and had tested the strength of the solution with the hydrometer, but had mixed up fresh solution even more frequently than was supposed to be required. On dismantling one of the tanks for holding the solution, he found the iron-work partially destroyed, and entirely covered with globules of mercury.

Mr. Thompson explained, that the hydrometer was not a correct testing instrument, if any vegetable matter was present in the solution: that the tanks on the premises of the Anti-Dry-Rot Company were necessarily made of unprepared timber: that the bi-chloride of mercury in solution, would penetrate any length of timber, if the extremities of the sap vessels were exposed to its action, but that it would not penetrate laterally without pressure; it was not therefore surprising that a water-tight tank, of unprepared wood, should decay on the outside, even if filled with the solution. With regard to the strength of the solution, at first it was believed that 1 lb. of corrosive sublimate to 20 gallons of water, was sufficiently strong, and much timber had been so prepared, but experience had since proved, that the strength of the mixture should not be less than 1 lb. to 15 gallons, and he had never found any well-authenticated instance of timber decaying when it had been properly prepared at that strength: as much as 1 in 9 was not unfrequently used. In a cubic foot of wood, prepared under a pressure of 70 lbs. per square inch, mercury had been found by the galvanic battery to have penetrated to the heart.

Mr. Horne mentioned, that a new process had been invented by Mr. Payne, for rendering timber proof against dry or wet rot, and the ravages of insects; for increasing its durability, and rendering it incapable of combustion. The mode of proceeding, was to impregnate the wood with metallic oxides, alkalis, or earths, as might be required, and to decompose them in the interior of the wood, forming new and insoluble compounds.

Mr. Taylor drew the attention of the meeting to a Memoir on the Preservation of Woods, which had been read before the French Academy of Sciences, by Dr. Boucherie. It was argued, that all the changes in wood were attributable to the soluble parts they contain, which cause fermentation and subsequent decay, or serve as food for the worms, that so rapidly penetrate even the hardest woods. By analysis, it was found that sound timbers contained from three to seven per cent. of soluble matter, and the decayed and worm-eaten, rarely more than one or two per cent.; since therefore the soluble matters of the wood were the causes of the changes it underwent, it became necessary, for its preservation, either to abstract these soluble parts, or to render them insoluble, by introducing substances which should prevent their fermenting. This might be done by many of the metallic salts or earthy chlorides. Pyrolignite of iron was particularly recommended as being a very effective substance, and cheaper than corrosive sublimate. The process was, to immerse the end of a tree, immediately after it was felled, in the solution of metallic salt, when, the vital energies not having ceased, the fluid was absorbed throughout all the pores of the tree, by a process which is termed "aspiration." The fluid had been applied in bags, to the base of the trees, when in a horizontal position, or to one of the branches, or by boring holes to the heart: a few branches and a tuft of leaves being always left at the top of the principal stem. It was necessary to apply the process speedily after felling the timber, as the vigour of the absorption was found to abate rapidly after the first day, and became scarcely perceptible about the tenth day,—whilst in dead wood, or where there was any accidental interruption of the flow of the sap during

growth, the "aspiration" entirely failed; resinous trees absorbed less of the fluid than any other.

The ends proposed to be attained by this process, were chiefly —preserving from dry-rot; increasing the hardness and the elasticity; preventing the usual changes of form or splitting; reducing the inflammability and giving various colours and odours, according to the nature of the fluid absorbed.

Mr. Bethell remarked, that the process described in Dr. Boucherie's pamphlet, was identical with that patented by him July 11th 1838, two years before Dr. Boucherie's was mentioned in Paris, which was in June 1840. The specification filed by Mr. Bethell stated* "that trees just cut down, may be rapidly impregnated with the solution of the first class, hereafter mentioned (among which is included the pryolignite of iron) by merely placing the butt ends in tanks containing the solution, which will circulate with the sap throughout the whole tree; or it may be done by means of bags, made of waterproof cloth, affixed to the butt ends of the trees and then filled with the liquid."

Mr. Bethell found that some solutions were taken up more rapidly by the sap and circulated with it more freely than others, and the pryolignite of iron seemed to answer best; he had not hitherto introduced the process in England, because it was much more expensive than the oil of tar, the pyrolignite costing from 6*d.* to 9*d.* per gallon, and the oil being delivered at 3*d.* per gallon.

Mr. Bethell had used similar tanks to those described in Mr. Timperley's paper, for preparing wood with the oil of tar, but as the oil is very penetrating, previous exhaustion of the air had been found unnecessary; the hydrostatic power being sufficient. The mode of working the tanks, was to charge them with timber, close them and fill them with the oil: a hydrostatic pressure of from 100 lbs. to 150 lbs. to the inch was applied by means of the force-pumps, and kept up for about six hours; this was sufficient to cause the wood to absorb from 35 to 40 gallons per load. By

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* See Specification in London Journal of Arts, March, 1842.

this means, a charge of timber was easily prepared daily, the cost being about 14*s*. per load.

This was the plan pursued at Manchester, for the Manchester and Birmingham Railway, by Mr. Buck (upon the recommendation of Mr. Robert Stephenson) and also at Bristol and Bridgewater, by Mr. Brunel. Mr. Bethell preferred egg-shaped ends for the tanks, as they resist the pressure better than flat ends.

The solution of corrosive sublimate, used at Hull, appeared to Mr. Bethell to be very weak. The advice given by Sir Humphrey Davy to the Admiralty, many years since, was to use 1lb. of corrosive sublimate, dissolved in 4 gallons of water, and Mr. Kyan, in the specification of his patent, states that strength; but according to the paper it appeared that 45 gallons of water were used to 1 lb. of the salt, instead of 4 lbs.

In answer to a question from Mr. Pellatt, Mr. Bethell stated that his experiments on the use of silicate of potash or soluble glass, for rendering wood uninflammable, were not yet concluded: he had proved its efficacy in this point—that as soon as the prepared timber was heated, the glass melted and formed a filmy covering over the surface, which protected it from the oxygen of the air and prevented its catching fire. The silicate also hardened the wood and rendered it more durable. This process was included in his patent of July 11th, 1838.

Professor Brande could add but little to what had been said on the subject, but he mentioned a curious appearance in a beech-tree in Sir John Sebright's park in Hertfordshire, which on being cut down, was found perfectly black all up the heart. On examination, it was discovered that the tree had grown upon a mass of iron scoriæ from an ancient furnace, and the wood had absorbed the salt of iron exactly in the same manner as had been described in the new process. The degrees of absorption of various solutions, by different woods, demanded careful experiments, as some curious results would be obtained: it was a question whether a solution of corrosive sublimate in turpentine, or in oil of coal-tar, would not be advantageous, as both substances were so readily absorbed by timber.

Mr. Defries explained the construction and action of his Dry Gas Meter, which was exhibited before it was fixed in the Gallery of the Institution.

The instrument consists of a hexagonal case, with three solid partitions radiating from the centre to the circumference; across each division, thus formed, is a flexible partition, to the centre of which is fixed a plate, connected by a lever and shafts with the valves on the top of the case; by means of a combination of levers and cranks, with a worm and screw, a circular motion is given to dials, indicating the quantity of gas which passes through the machine.

The gas, on entering the upper chamber, passes through the valve into the first division, and distends the flexible partition until the lever is carried to a certain point, when by means of the connecting shaft, the inlet valve is closed, the outlet valve is opened, and the second division commences its action, which is continued by the third, thus producing an equal flow of gas; and an uniform motion is given to the counter-dials, which necessarily indicate the number of times the divisions have been inflated and emptied, and thus measure the quantity which has passed through in a given time.

The instrument which was presented to the Institution, had its sides formed of glass, in order to show the action of the machinery.

COPYRIGHT OF DESIGNS.

Amid the long and tedious discussions which have occupied both Houses of Parliament, during the past Session, respecting the financial state of the country, we could hardly expect that any detailed improvements would have been attempted in the protection and encouragement of individual genius or ingenuity. We have, however, not only to congratulate literary authors on the extended possession their families will enjoy of the works which they have created, but also to draw the attention of all artists, connected with manufactures, to the extended protection,

from piracy, their designs will receive, under an Act passed immediately before the prorogation of Parliament, entituled "An Act to Consolidate and Amend the Laws relating to the Copyright of Designs for Ornamenting Articles of Manufacture."

By this Act, which comes into operation on the 1st of September, designs are registered under classes, of which there are thirteen in number; but, if it is required, the same design may be secured under two or more of the classes. The proper fees to be paid, and the duration of the term for protecting the pattern, are as under:—

Duration of Protection. yrs.	mos.		Fees paid to Registrar.		
3	0.	—Class 1.—Articles of Manufacture composed wholly or chiefly of any Metal or mixed Metals - - - - - - -	£3	0	0
3	0.	-Class 2.—Articles of Manufacture composed wholly or chiefly of Wood - - -	1	0	0
3	0.	-Class 3.—Articles of Manufacture composed wholly or chiefly of Glass - - -	1	0	0
3	0.	-Class 4.—Articles of Manufacture composed wholly or chiefly of Earthenware - -	1	0	0
3	0	-Class 5.—Paper Hangings - - -	0	10	0
3	0	-Clase 6.—Carpets - - - -	1	0	0
	9	-Class 7.—Shawls, if the design be applied solely by printing, or by any other process by which colours are or may hereafter be produced upon tissue or textile fabrics -	0	1	0
3	0.	—Class 8.—Shawls, not comprised in Class 7. -	1	0	0
	9.	—Class 9.—Yarn, Thread, or Warp, if the design be applied by printing, or by any other process by which colours are or may hereafter be produced - - - -	0	1	0
	9.	—Class 10.—Woven fabrics, composed of Linen, Cotton, Wool, Silk, or Hair, or any two or more of such materials, if the design be applied by printing, or by any other process by which colours are or may hereafter be pro-			

	duced upon tissue or textile fabrics; excepting the articles included in Class 11 -	0	1	0
3 0.	—Class 11.—Woven fabrics, composed of Linen, Cotton, Wool, Silk, or Hair, or of any two or more of such materials, if the design be applied by printing, or by any other process by which colours are or may hereafter be produced upon tissue or textile fabrics, such woven fabrics being or coming within the description technically called furnitures, and the repeat of the design whereof shall be more than twelve inches by eight inches -	0	5	0
1 0.	—Class 12.—Woven fabrics, not comprised in any preceding Class - - - - -	1	0	0
1 0.	—Class 13.—Lace, and any article of manufacture or substance, not comprised in any preceding Class - - - - - -	1	0	0

The duties of the Registrar are, that "he shall not register any design in respect of any application thereof to ornamenting any articles of manufacture or substance, unless he be furnished, in respect of each such application, with two copies, drawings, or prints of such design, accompanied with the name of every person who shall claim to be proprietor, or of the style or title of the firm under which such proprietor may be trading, with his place of abode or place of carrying on his business, or other place of address, and the number of the class in respect of which such registration is made; and the Registrar shall register all such copies, drawings, or prints, from time to time successively, as they are received by him for that purpose; and on every such copy, drawing, or print, he shall affix a number corresponding to such succession; and he shall retain one copy, drawing, or print, which he shall file in his office, and the other he shall return to the person by whom the same has been forwarded to him; and in order to give ready access to the copies of designs so registered, he shall class such copies of designs, and keep a proper index of each class."

Scientific Adjudication.

VICE CHANCELLOR'S COURT.

July 30th, 1842.

RODGERS *v.* STOCKER & OTHERS.

This was a motion to remove an injunction, obtained in this Court, some few months back, by Rodgers against Stocker and others, restraining them from manufacturing a certain kind of improved hook and eye, which was alleged to be similar to, and an infringement of, a patent, granted to Rodgers, for an invention communicated to him by a foreigner residing abroad, dated 13th May, 1839.*

On behalf of the defendants, many affidavits were produced, shewing that the injunction ought to be removed, on the grounds, that the invention was not new at the time of granting the patent to Rodgers, and that for other reasons the patent was not valid.

The defendant stated, that the particular spring hook which constituted the subject of infringement complained of, was nothing more than an imitation of an old hook, the tongue of which, being pressed closer to the stem, formed a spring-stop, retaining the eye or ring from slipping off, when passed into the hook beyond the band, and that many other spring hooks, long known, had the same properties. That the said foreigner who made the communication to Rodgers, was indeed a foreigner, an American citizen, but he had long resided in this country, and went on to the continent for the express purpose of making the communication to Rodgers, and immediately returned; consequently, the pretence of his residing abroad, was evasive, and therefore the patent could not be valid.

To these objections the plaintiff replied, by a number of affidavits, that the old hook produced, was not a spring hook,—had

* For Specification of this Patent, see Vol. XX., p. 29, of our present Series.

never been intended as such, and had been put up by defendants on purpose to resemble the patentee's improved spring hook; and that the other spring hooks produced, were altogether different in principle.— The question of the invalidity of the patent, on the grounds of the objection—that the real inventor had indeed a residence in England, could not be gone into, except under a writ of *scire facias.*

JUDGMENT.

The Vice Chancellor.—Now I quite agree, that the matter is now to be considered precisely in the same manner as if no previous injunction had been obtained, and the point came on before the Court with all the conflicting evidence; but I apprehend, that it is not the habit or the course of the Court, on applications for injuctions in such cases, to determine, positively, whether the patent is good or bad, but the Court looks to see, first of all, whether there has been an enjoyment under the patent; and the Court has been in the habit of considering enjoyment under a patent to be such good evidence of rightful possession, that it is not in the habit of allowing speculative inferences which are drawn from facts stated; for instance,—the thing not being an invention, or the thing having been used before, and so on, to countervail against the *prima facie* right which possession has given to the plaintiff. That is the way in which, as I understand, that part of the law has always been administered in this Court.

Now the Court has to consider, whether there is sufficient evidence of infringement. I cannot but myself say, that, with respect to that latter point, that really the two things appear to me to be substantially the same, although there is a variation. I must exercise some judgment on the point; and though my judgment may be erroneous, I do not mean that it shall be conclusive on the parties; but if I do, on the evidence that is presented to me, think that there has been an infringement of the patent, supposing there was a patent,—and I do find this evidence in favor of supposing it to be a good patent, namely,—that

there has been that enjoyment which is stated on the affidavits, —I apprehend that, without regard to hardship, I must look to what is the mere justice of the case,—that is the mere rule of law, as administered by this Court.

Well, now then with respect to the enjoyment,—the patent having been taken out on the 13th of May, and the specification having been enrolled on the 12th of November, in the year 1839, this affidavit is made by the plaintiff on the 13th of June, this last month, and in that he swears that he has, ever since the date of the letters patent, manufactured according to the principle of the invention, and vended and disposed of, and still continues to manufacture, vend, and dispose of, large quantities of hooks, and so on, according to the principle; and that appears to me to be mainly supported by these affidavits of Andrews, Peyton, Cattel, and Van Wart, and so on; so that there is no doubt left upon my mind, that there has been a very considerable enjoyment in the way of making and selling those articles, for the protection of which the plaintiff took out the patent.

Now, it may be perfectly true, that when the matter comes before a Jury, as in my opinion it ought, that the Jury may have either these facts alone, or additional facts, laid before them, on which they may come to a conclusion, that the patent is not a good patent; and they may come to the conclusion, that there has been no infringement of it, supposing it to be a good patent; that is for the Jury in a future stage of the cause. But my opinion is, that there is so much evidence of the validity of the patent, by reason of past enjoyment, and so much evidence of infringement, that even if the matter had now been brought before me *de novo*, I should have felt myself bound to grant the injunction, and, having granted it, I think that I am bound to continue it; and it seems to me, therefore, that I must continue the injunction; but I must direct the plaintiff to brirg such action as he may be advised.

NORTHERN CIRCUIT, LIVERPOOL.

BEFORE MR. JUSTICE MAULE.

August 10, 1842.

SMITH *v.* WATSON.

This was an action for the infringement of two patents, granted to the plaintiff, Mr. Andrew Smith, engineer and patentee, of the wire rope, in the years 1835 and 1836.* The first patent being for an invention of a new standing rigging, composed of iron wire, and the second patent for an invention of an improvement on the first.

The defendant pleaded,—first, that the plaintiff was not the true inventor; second, that the inventions were not manufactures; third, that the inventions were of no use; fourth, that the inventions were not new as to the public use; fifth, that the specifications were not sufficient; sixth, that the specifications were not duly inrolled; and seventh, that the defendant did not infringe the patents. Mr. Hindmarsh appeared on behalf of the plaintiff, and Mr. Corrie for the defendant.

Mr. Hindmarsh, in opening the proceedings, entered generally into the properties of the standing rigging, made of hemp, as compared with that composed of wire, under the patents granted to the plaintiffs, pointing out the superiority of the latter, both as regards lightness of weight, and diminution of bulk or space in standing rigging, which was important, in presenting less surface to the wind. Another advantage which the wire rope or rigging possessed, was that of it not being affected by moisture.

The counsel proceeded to observe on the specification and drawings, explaining to the jury the several modes of manufacture. From the descriptions, we gathered, that, for standing rigging, a series of iron wires were laid in a straight or parallel line or salvage fashion, the tension, which in no way diminishes the size of the rope, or lengthens the same, and which is necessary to obtain an equal strength, being acquired by application of ma-

* For Specification of these Patents, see Vol. VII., p. 359, and Vol. X., p. 171.

chinery to that object. The specimens submitted to the jury varied from $1\frac{1}{2}$ to 3 inches in circumference, and the wires of which such ropes were formed, from 50 to 150 inches; the rope, thus formed, is then saturated with a solution of Indian-rubber, and the interstices so filled up, it is then "parcelled" or covered with a binding of woollen list, so as to exclude the moisture, and to protect the wires from oxidation; this being done, the rope is "served over" or bound round with spun yarn, so that, when finished, it represents the appearance of the ordinary hempen rope, with the exception of its being one-half the size of that of hemp. He was informed, that one of the grounds of defence was, that lines, or strings of hemp, forming a rope or rigging of a similar construction to that of the wire rope, had been used, such lines or strings having been "served," as with the wire rope or rigging, and thus, that there was no novelty in the invention; but he would be prepared to shew, and it was perhaps a question for the Court to determine, whether the application of wire, as in this case, was not a manufacture under the Act, inasmuch that although the application might be the same, the material used was altogether dissimilar. As regarded the second patent, which was simply an improvement on the first, in making the loop, or so splicing the wire, as to obtain a firm hold, he presumed no objection could arise, and having entered fully on the question, the learned counsel proceeded to call his witnesses.

The first witness called, was Mr. Whellan, 72 years of age, who stated, "That he was a master rigger in Liverpool, having been 40 years in this port, and employed in such capacity since 1805; since which period he had rigged a number of vessels, (760, as we understood, with hempen rope.) Had never known of wire rigging being used before the date of plaintiff's patent in 1835. Has since fitted the 'Great Liverpool,' of 1400 tons, with rigging of that description. The 'John Garrow,' 'Guadalupe,' and many others. Considered the invention as useful, and that the wire rope had a decided advantage as to strength; as the same time, that it was less bulky, and consequently held lest wind."

Upon the cross examination of this witness by the Court, he stated, "That he had been engaged in fitting steam-vessels, for the last 20 years, that the rigging had been, so far as the funnel was concerned, part iron chains, and part hempen rope."

Mr. Binks, the foreman of the plaintiff, and who had manufactured the wire rigging, was next examined:—

"He had, from an early age, been employed under Government as a rope-maker, having been 34 years in that employment, and for the last 8 years been engaged by the plaintiff in the manufacture of wire strands, rigging, and ropes; had never heard of wire rope or rigging before the patent of Mr. Smith; considered it a very desirable thing, and believed that any one might manufacture the article from the description given in the specification, which was so simple, that no difficulty could exist with any practical man. The second patent was an improvement on the first, in forming the loop and splicing, which was imperfect in the original patent." The evidence of this witness, as to the comparative strength, lightness, and security, was fully corroborative of that previously given.

Mr. Shaw, marine manager of the City of Dublin and Oriental Steam Companies, was next examined; his evidence was to the effect:—

"That having heard, by chance, of the patented wire standing rigging, in 1838, he was induced to test it, and accordingly applied it to vessels belonging to the City of Dublin Steam Company; that the result had been highly satisfactory, and that he had since used it in numerous instances, in preference to hempen rope."

Captain Bevis, R. N., holding an appointment under Government, at Liverpool, as superintendent of the Mail Department, was next examined; he deposed:—

"That he had, by the directions of the Admiralty, examined and carefully surveyed the 'John Garrow,' an iron vessel, (800 tons,) rigged with the plaintiff's wire rope, and had reported thereon,—that he found the patent rigging to answer every purpose, and considered it as an excellent invention; the rigging he found to be in a perfect state, having examined it with care."

Mr. Robertson, a rope-maker, deposed:—

"That he was in the habit of making standing rigging; that he had rigged 30 vessels with the wire rigging, not of his own manufacture, but that of the plaintiff's; never knew such description until the patent of the plaintiff's; had read the specifications of the several patents of 1835 and 1837, and could readily manufacture the rope or rigging from the description therein given, and the accompanying drawings." On cross examination, he stated:—"That he had never made any wire rope, but had applied it in many cases."

Mr. Grantham, who is an engineer, and largely embarked in iron ship-building, deposed:—

"That having read the specifications, and examined the drawings, he should feel no difficulty in manufacturing the standing rigging or rope, as therein described; had been practically acquainted with engineering and mechanics for the past 17 or 18 years; could not apprehend that the slightest difficulty would present itself, to any person, in the manufacture under the specication; had never heard of any similar application of iron wire or rods as that comprehended in the patent, and which he considered exceedingly valuable and a useful invention." On cross examination, the witness stated:—"That he was an engineer by profession; that he had never known wire applied to rope, or heard of the invention antecedent to the plaintiff's patent." The counsel for the defendant having drawn the attention of the witness to the manufacture of a toasting-fork, he admitted:—"That such an application was certainly not novel, but it was distinct from a rope or rigging; had seen wire employed in many ways, but never as a rope, until the plaintiffs patent." Witness described the specification as understood by him, and expressed his belief, "that the meaning of the claim, put forward by the patentee, was that of embracing the manufacture of all metallic ropes, or combination of wires, according to the specification, without reference to the metal of which such wires are composed."

Mr. Hindmash then put in admissions of the patents and specifications, and the fact that the defendant had infringed them,

which were read, and closed the plaintiff's case. The learned counsel admitting, that from the absence of a witness, he had no evidence to shew that the second patent had been infringed.

Mr. Corrie proceeded to address the Jury on the merits of the case, or, as he would rather designate it, the demerits, and directed the attention of the learned Judge to the legal and technical objections, which he considered might be fairly brought forward, and which could not, in his opinion, have any other effect than that of obtaining a verdict for his client. The manufacture which the plaintiff claimed to himself, was in reality no invention of a new manufacture, and the specification was nothing more than a general claim; indeed, on reference to the words in which the specification was summed up, it would be apparent to his Lordship, that there were no grounds for the action, whereon the plaintiff could claim a verdict. It had been shewn, that rods or links of iron had been previously used for standing rigging, or stays, on board of vessels, and that he believed his Lordship, and the Jury, would be of opinion, that the manufacture was by no means novel, or deserving of that protection contemplated and acquired under the statute of James. Again, supposing, for a moment, that it should be, in the opinion of the Court, as coming under such a statute, and was designated a manufacture, he should then contend, that such manufacture was not novel, inasmuch that he had an illustration sufficient for his purpose in the manufacture of a toasting-fork, which, being composed of twisted wires, was in fact the same as the wire rope, or standing rigging, the material of which it is composed being the same. On this ground he applied to the Jury to give a verdict for the defendant.

The learned Judge here interrupted Mr. Corrie, by observing, that it was a very different thing to toast bread on a toasting-fork, and to apply it to the end of a rope.

Mr. Corrie continued, by adverting to cases which had been determined, and on which he relied as precedents in the present instance, for however contrasted it might appear, the application of wire to a toasting-fork with that of wire rope, yet that it was not greater than the case he was about to cite. The learned

counsel then referred to a case reported in Barnwell, of an action having been brought on the question, whether a patent was valid, and could be maintained for the construction of anchors, by the formation of the bow, or other part of the anchor, in one piece or part, whereas such portion of the anchor had previously been made of two pieces or parts; the question raised was, whether it was a new manufacture, so as to justify a patent being granted, it being shewn, that a hammer, which was formed of one piece, was similar in its manufacture, although not applied to a like purpose. It was determined, that the patent could not be maintained, a similar mode of manufacture having been practised in the construction of an article, although it might be applied to a perfectly different purpose. On these grounds, he contended that the application of wire, in the manufacture of a toasting-fork, bore upon the patent at issue, inasmuch, that although the application was different, yet that the idea was not novel, but, in the latter case, a mere adaptation of a known invention to a different object. The learned counsel admitted the usefulness and value of the invention, which, as he observed, could not be controverted, after the evidence afforded that day; but, as he contended, there was no novelty in such invention to which the plaintiff could lay claim,—he should leave it in the hands of a Jury.

Justice Maule having submitted to the counsel for the plaintiff, that a question might be left with the Court to determine,—whether the invention or manufacture was a fit subject for a patent?—Mr. Hindmarsh preferred leaving the question to be decided by a Jury, who were accordingly charged by the learned Judge, submitting the main points of evidence adduced; at the same time expressing his opinion, that if the question was left with him, he should at once declare the patent good, and give a verdict for the plaintiff; but, as the question was one of importance, he felt it necessary, should it have been left to the decision of the Court, to have consulted his learned Brother; as such course, however, had not been adopted by the counsel for the plaintiff, he should leave it in the hands of the Jury.

Throughout the charge, the learned Judge evidently went with the plaintiff. On application made by the counsel for the defendant, leave was given to move for a nonsuit on one of the counts, and, with such reservation, the Jury, without hesitation, found a verdict for the plaintiff. The Judge expressed his readiness to certify for costs.

SMITH *v.* WATSON.

This was a second action, between the same parties, as in the former case, involving the merits of a further patent, taken out in the year 1839, for the manufacture of wire rope, in a form and manner dissimilar to the last named patents, being a twisted rope, formed of strands, as in the manufacture of hempen rope, the only difference being in the material. The address of the learned counsel was a mere echo of his speech on the first action; and the evidence generally, throughout, was a mere repetition or confirmation of that previously given, the only difference being, that the evidence was here given as to the merits of the wire rope, and not to that of standing rigging or salvage rope.

The first witness called, was Mr. Binks, the foreman of the plaintiff, whose evidence was of a similar character as in the preceding cause.

The next witness examined was Mayes, who described himself as a rigger, having been employed on the Blackwall Railway. In the course of his duties he had laid down 16 miles of hempen rope on the railway, when first opened, the circumference of which was from 5½ inches to 7½. The wire rope of the plaintiff had been applied on the railway upwards of twelve months since. The carriages on the line were drawn by a length of rope, which was wound over a drum, by means of a stationary engine at each terminus. Witness had never heard of any wire rope, until he became acquainted with that of the plaintiff's. The wire rope had been found to answer the purpose, and the consequence was, that the use of hempen rope had been discontinued, and the whole of the line was now worked with wire rope. Had tested the

strength of wire rope, of 4 inches circumference, with various specimens of hempen rope, varying in size from 5½ inches to 7½, and found the former to be of greater strength than the latter. Had never known the plaintiff's rope to break, although the swivels and splicings had, in some instances, given way. The hempen rope, when in use, was subject to continued breakages, having known the rope to break two or three times in one day. Witness considered the invention as useful, and more economical, from there being less wear and tear, as also it being of smaller circumference, and less in weight.

Mr. Woods, engineer of the Liverpool and Manchester Railway, was next examined, and deposed to the plaintiff's wire rope being used in the tunnel, at the Liverpool terminus, and answering the purpose.

Mr. Leslie, the manager of the Anderton Carrying Company, in the course of his examination, stated:—"That he had applied the wire rope of the plaintiff to raising weights, and also on an inclined plane. Since he had tested its properties, he was convinced, that it was an invaluable invention, and a great benefit to the community." On the cross examination of this witness, he was asked:—"Whether he had not seen twisted wire applied to the corks of porter bottles?"—The learned counsel for the defendant contending, from the fact of wire having been twisted for such a purpose, that it came under the designation of wire cord or rope, the original invention of which the plaintiff claimed.—This closed the case on the part of the plaintiff.

Mr. Corrie, on the part of the defendant, addressed the Jury on the question at issue, which was:—Whether, in the first place, the plaintiff was the inventor of the manufacture claimed under the patent? and next:—Whether such manufacture was an invention coming under the statute of James? He then put in, as evidence, the drawing which accompanied the specification of the patent of 1837, to which he directed the attention of the Jury, the learned counsel contending, that the twisted wire rope was comprehended in such patent, and, therefore, could not be claimed under the patent of 1839. To illustrate this view of the case, he

proceeded to remark on the similarity displayed in the patents of 1837 and 1839, as related to the twisting of the wire; it appearing, however, that in the former case the wire was simply entwined in forming a splice, while in the latter it was regularly laid in stands, and formed as a hempen rope. He further proceeded to descant on the principle having been applied long ere the patent of the plaintiff's, twisted wire or cord being used in securing the corks of porter bottles, as well as for suspending the ladies, at the opera, *in nubibus.*

The learned Judge, in addressing the Jury, commented on the objections raised, stating, that the Jury could not do otherwise than give a verdict for the plaintiff, which was done accordingly. The counsel for the defendant, as in the former case, asked for leave to move the Court, which was granted, and the Judge certified costs.

CONVICTION FOR PIRACY OF A REGISTERED DESIGN.

The summary way in which cases of this kind are disposed of, not been generally known, we think the following may be interesting to our readers, as it is one of the first which has taken place under the registration act.

Mr. Bingham, a magistrate at Worship Street, gave his judgment on a case, instituted by Messrs. Kipling and Co., Carpet Manufacturers at Darlington, against Mr. G. Johnson, of Finsbury Square, for publishing and disposing of, for profit, without the licence or consent of the plaintiffs, a carpet, the designs or pattern of which had been registered agreeable to the Act 2nd Victoria, chap. 17. There was a second summons against the defendant, for an alleged piracy of another of Messrs. Kipling and Co's designs, which it was agreed should be determined by the magistrate's first decision. The counsel for the plaintiffs was Mr. Clarkson,—for the defendant, Mr. Chambers.

Mr. Joseph Ratheray, agent for the plaintiffs, stated, "That,

on the 15th of March, he registered for them the two new patterns of carpets now produced. The pieces of carpet, sold by the defendant, were copies of the registered patterns, slightly varied. On the 20th or 21st of June, he met the defendant in Newgate Street, and whilst conversing on the subject, the latter said, 'That he had been to the Registration Office, to ascertain whether the patterns had been registered or not, and he found that they had.'" Cross-examined by Mr. Chambers.—"The drawing now pointed out, is technically called 'the design,' and its combination with the other parts, constitutes the finished and original pattern."

A piece of floor-cloth being then shewn to the witness, he said, "That the figures in it bore some resemblance to the registered design, but there was a difference in the filling up, such as the substitution of a line for a diamond, and so on."

Mr. Henry Ridley Ellington, manager of the plaintiffs' business in Newgate Street, proved "That he purchased the pieces of carpet, now produced, at Mr. Johnson's shop, in Finsbury Square, on the 15th of July, and that Mr. Johnson then said, 'He conceived he had a right to sell them without reference to their being registered.'"

The pieces of carpet, sold by the defendant, being now compared with the registered patterns, were found to resemble them in the principal figures, but the filling-up was slightly varied.

Mr. Bingham, in giving judgment, said, "It was his opinion, that the design of the carpet produced by the plaintiffs, was an original design; that the one sold by the defendant was a copy, and that he sold it, knowing that no consent had been given. Upon all the points, it was a case within the meaning of the Act, which rendered the defendant liable to a penalty of from five to fifty pounds."

The defendant was then ordered to pay a mitigated penalty of five pounds and the costs, upon each of the two summonses.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th June to the 17th of August, 1842, inclusive.

To Mathias Nicolas La Roche Barrie, of St. Martin's-lane, in the county of Middlesex, manufacturer of cotton, for an improvement in the manufacture of a fabric, applicable to sails and other purposes.—Sealed 1st July.

Henry Barron Rodway, of Birmingham, in the county of Warwick, wine merchant, for improvements in the manufacture of horse-shoes.—Sealed 1st July.

Gottlieb Boccius, of the New Road, Shepherd's Bush, in the county of Middlesex, Gent., for certain improvements in gas, and on the methods in use,—or burners for the combustion of gas.—Sealed 1st August.

Thomas Henry Russell, of Wednesbury, in the county of Stafford, iron tube-maker, and Cornelius Whitehouse, of the same place, for improvements in the manufacture of welded iron tubing.—Sealed 3rd August.

Joseph Clisild Daniell, of Tiverton Mills, near Bath, for improvements in making and preparing food for cattle.—Sealed 3rd August.

Michael Coupland, of Pond-yard, Park-street, Southwark, millwright and engineer, for improvements in furnaces.—Sealed 4th August.

Robert Warrington, of South Lambeth, in the county of Surrey, Gent., for improvements in the operations of tanning.—Sealed 6th August.

List of Patents

Granted for SCOTLAND, subsequent to July 22nd, 1842.

To William Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for certain improved machinery for excavating, dredging, and removing earthy and stony matters, in the construction of rail-roads, canals, cleaning of rivers, harbours, and redeeming of marshy or alluvial soils; also for boring rocks, indurated clay, and other earthy matters, for the purpose of blasting and removing the same; the whole to be worked by steam and other power,—being a communication from abroad.—Sealed 25th July.

Thomas Hendry, of Glasgow, Scotland, mechanic, for certain improvements in machinery for preparing and combing wool and other fibrous materials.—Sealed 27th July.

Thomas Waterhouse, of Edgeley, in the County of Chester, manufacturer, for a certain improvement or improvements in machinery used for carding, drawing, and roving cotton, wool, flax, silk, and other similar fibrous material.—Sealed 27th July.

John Osbaldeston, of Blackburn, in the County of Lancaster, metal heald maker, for improvements in looms for weaving.—Sealed 29th July.

William Geeves, of Old Cavendish-street, in the County of Middlesex, Gent., for improvements in machinery for cutting cork. Sealed 29th July.

John Woodcock, of Manchester, in the County of Lancaster,—millwright, for certain improvements in the construction of steam-engines.—Sealed 1st August.

Alexander Johnston, of Hillhouse, in the county of Edinburgh, Esq., for certain improvements on carriages, which may also be applied to ships, boats, and various other purposes, where locomotion is required.—Sealed 2nd August.

Julius Seybell, of Golden-square, Westminster, in the County of Middlesex, manufacturing chemist, for certain improvements in the manufacture of sulphate of soda and chlorine.—Sealed 11th August.

Benjamin Biram, of Wentworth, in the County of York, colliery viewer, for certain improvements in the construction and application of rotary engines.—Sealed 11th August.

John Anthony Tielens, of Fenchurch-street, in the City of London, merchant, for improvements in machinery or apparatus for knitting,—being a communication from abroad.—Sealed 22nd August.

New Patents

SEALED IN ENGLAND.

1842.

To Thomas Bell, of St. Austell, in the county of Cornwall, mine agent, for improvements in the manufacture of copper.—Sealed 29th July—6 months for inrolment.

Jules Lejeune, of North-place, Regent's Park, engineer, for improvements in accelerating combustion, which improvements may be applied in place of the blowing machines now in use.—Sealed 29th July—6 months for inrolment.

John Stephen Woolrich, of Birmingham, chemist, for improvements in coating, with metal, the surface of articles formed of metal or metallic alloys.—Sealed 1st August—6 months for inrolment.

Alfred John Phipps, of the Blackfriars-road, Gent., for certain improvements in paving streets, roads, and ways.—Sealed 1st August—6 months for inrolment.

Joseph Whitworth, of Manchester, engineer, for certain improvements in machinery or apparatus for cleaning roads, and which machinery is also applicable to other similar purposes.—Sealed 2nd August—6 months for inrolment.

John Dry, of Beverley, agricultural implement-maker, for certain improvements in thrashing machines.—Sealed 2nd August—6 months for inrolment.

Samuel Carson, of York-street, Covent Garden, Gent., for improvements in purifying and preserving animal substances.—Sealed 3rd August—6 months for inrolment.

Archibald Turner, of Leicester, manufacturer, for improvements in the manufacture of muffs, tippets, ruffs, mantillas, cloaks, shawls, capes, pellerines, boas, cuffs, slippers, and shoes.—Sealed 3rd August—6 months for inrolment.

John Lee, of Weston-street, Bermondsey, Gent., for improvements in wheels and axletrees, to be used on railways; and in machinery for stopping on, or preventing such carriages from running off, railways; which improvements may also be applied to other carriages and machinery.—Sealed 3rd August—6 months for inrolment.

Charles Henri Perrin, of George-yard, Lombard-street, London, for some improvements in the construction of certain parts of the mechanism used in watches and chronometers, which improvements are also applicable to some kinds of clocks.—Sealed 8th August—6 months for inrolment.

David Napier, of Mill Wall, engineer, for improvements in steam-engines and steam-boilers.—Sealed 9th August—6 months for inrolment.

Thomas Walker, of Birmingham, stove-maker, for improvements in stoves.—Sealed 9th August—6 months for inrolment.

Richard Ford Sturges, of Birmingham, manufacturer, for a certain improvement in the manufacture of Britannia metal and plated wares.—Sealed 10th August—6 months for inrolment.

Dominic Frick Albert, of Cadishead, Doctor of Laws, manufacturing chemist, for a new combination of materials, for the purpose of manufacturing a manuring powder.—Sealed 10th August—6 months for inrolment.

Moses Poole, of Lincoln's Inn, Gent., for improvements in paving or covering roads and other ways,—being a communication.—Sealed 11th August—6 months for inrolment.

Joseph Betteley, of the Brunswick Anchor Works, Liverpool, chain-cable manufacturer, for improvements in windlasses and machinery for moving weights.—Sealed 11th August—6 months for inrolment.

John Thomas Betts, of Smithfield Bars, Gent., for improvements in covering and stopping the necks of bottles,—being a communication.—Sealed 11th August—6 months for inrolment.

George Roberts, of Park-place West, Liverpool-road, miner, for improvements in the construction of lamps.—Sealed 15th August—6 months for inrolment.

William Raybould, of St. James' Walk, Clerkenwell, brass-founder, for a new or improved soldering iron.—Sealed 18th August—2 months for inrolment.

George John Newbery, of Cripplegate-buildings, artist, for certain improvements in producing damask and other surfaces on leather and other fibrous substances and fabrics.—Sealed 18th August—6 months for inrolment.

Nathan Defries, of Grafton-street, Fitzroy-square, engineer, and Nathaniel Fortescue Taylor, of Cleveland-street, Mile End, engineer, for improvements in meters for gas and other fluids.—Sealed 18th August—6 months for inrolment.

William Ridgway, of Northwood, Stafford, earthenware manufacturer, for a new method of conveying and distributing heat in ovens, used by manufacturers of china and earthenware, and brick, tile, and quarry-makers.—Sealed 18th August—6 months for inrolment.

Goldsworthy Gurney, of Great George-street, Westminster, in the county of Middlesex, Gent., for certain improvements in apparatus for producing, regulating, and dispersing light and heat.—Sealed 18th August—6 months for inrolment.

Richard Else, of Gray's Inn, Esq., for certain improvements in machinery or apparatus for forcing and raising water and other fluids.—Sealed 18th August—6 months for inrolment.

Thomas Hendry, of Glasgow, Scotland, mechanic, for certain improvements in machinery for preparing and combing wool and other fibrous materials.—Sealed 25th August—6 months for inrolment.

David Redmund, of Charles-street, City-road, engineer, for improvements in hinges or apparatus, applicable to suspending or closing doors and gates, and other purposes.—Sealed 25th August—6 months for inrolment.

CELESTIAL PHENOMENA for September, 1842.

D.	H.	M.	
1			Clock after the sun 0m. 6s.
—			☽ rises 0h. 42m. M.
—			☽ passes mer. 8h. 41m. M.
—			☽ sets 4h. 53m A.
3			♂ in conj. with the ☽ diff. of dec. 3. 59. N.
4	10	15	Ecliptic conj. or ● new moon.
	11		☽ in Perigee.
5			Clock after the sun, 1m. 22s.
—			☽ rises 6h. 7m. M.
—			☽ passes mer. 0h. 23m. A.
—			☽ sets 6h. 21m. M.
	9	30	☿ in conj. with the ☽ diff. of dec. 6. 6 N.
7	16	11	♀ in conj. with the ☽ diff. of dec. 3. 56. N.
8	17	43	♃ stationary
9	8	53	♃'s third satt. will em.
9	9	7	♃'s first satt. will em.
10			Vesta in the ascending node
—			Clock after the sun 3m. 3s.
—			☽ rises 1h. 11m. A.
—			☽ passes mer. 4h. 56m. A.
—			☽ sets 8h. 38m. A.
—			Occul *a* Scorpii, im. 8h. 26m.
11	3	58	☽ in □ or first quarter.
11	16	28	♄ stationary
12			Occul λ in Sagitarii, im. 10h. 5m. em. 11h. 11m.
	7	59	♃'s second satt. will em.
12	16	39	♄ in conj. with the ☽ diff. of dec. 1. 24. N.
13	2	37	♃ in conj. with ☽ diff. of dec. 0. 11. N.
	3	17	☿ in the descending node
14			Mercury R. A. 12h. 30m. dec. 3. 24. S.
—			Venus R. A. 14h. 13m. dec. 15. 20. S.
—			Mars R. A. 9h. 54m. dec. 14. 1. N.
—			Vesta R. A. 8h. 16m. dec. 19. 51. N.
—			Juno R. A. 16h. 11m. dec. 8. 31. S.
—			Pallas R. A. 5h. 30m. dec. 11. 0. S.
—			Ceres R. A. 7h. 30m. dec. 23. 34. N.
—			Jupiter R. A. 18h. 56m. dec. 23. 11. S.
—			Saturn R. A. 18h. 33m. dec. 22. 49. S.
—			Georg. R. A. 23h. 48m. dec. 2. 6. S.
—			Mercury passes mer. 0h. 58m.
—			Venus passes mer. 2h. 41m.
—			Mars passes mer. 22h. 20m.
—			Jupiter passes mer. 7h. 22m.
—			Saturn passes mer. 7h. 0m.
—			Georg. passes mer. 12h. 14m.
	2	14	Pallas □ with the sun
15			Clock after the sun, 4m. 47s.
—			☽ rises, 4h. 34m. A.
—			☽ passes mer. 9h. 11m. A.
—			☽ sets 0h. 47m. M.
16	9	33	♃'s third satt. will im.
	11	2	♃'s first satt. will em.
17	21		☽ in Apogee.
19	5	53	Her. in oppo. to the ☉
	6	34	Ecliptic oppo. or ○ full moon
	10	35	♃'s second satt. will em.
	11	19	Her. in conj. with the ☽ diff. of dec. 6. 2. S.
20			Clock after the sun, 6m. 33s.
—			☽ rises 5h. 48m. A.
—			☽ passes mer. Morn.
—			☽ sets 6h. 30m. M.
21			Occul 101 Piscium, im. 17h. 41m. em. 18h. 10m.
22			Juno greatest Hel. Lat. N.
	23	26	Sun enters Libra, Autumn commences
23			Occul 47 Arietis, im. 7h. 35m. em. 8h. 30m.
23	6	50	☿ in Aphelion.
	12		♀ in Aphelion
25			Occul *k* in Tauri, im. 12h. 44m. em. 13h. 51m.
25			Clock after the sun, 8m. 18s.
—			☽ rises, 7h. 57m. A.
—			☽ passes mer. 3h. 42m. M.
—			☽ sets, 0h. 18m. A.
26			Occul *B* in Tauri, im. 9h. 47m. em. 10h. 39m.
27	3	5	☽ in □ or last quarter
30	18		♂ greatest Hel. Lat. N.

J. LEWTHWAITE, Rotherhithe.

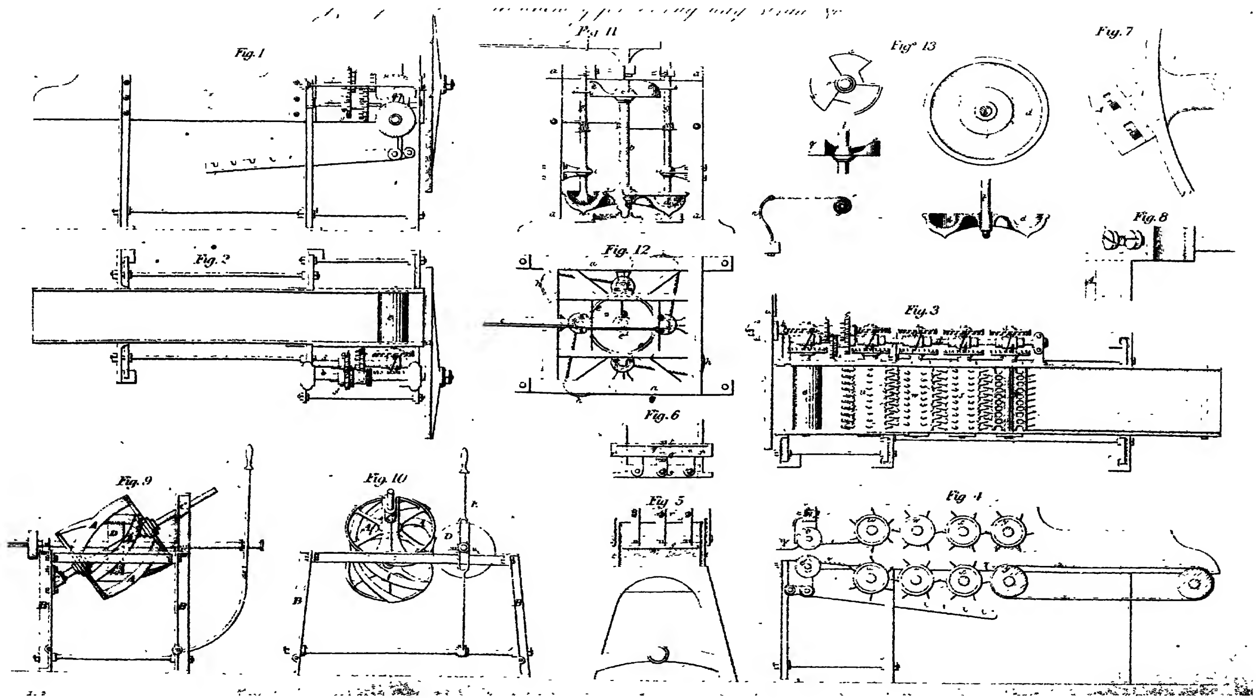
Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9
Fig. 10
Fig. 11
Fig. 12
Fig. 13

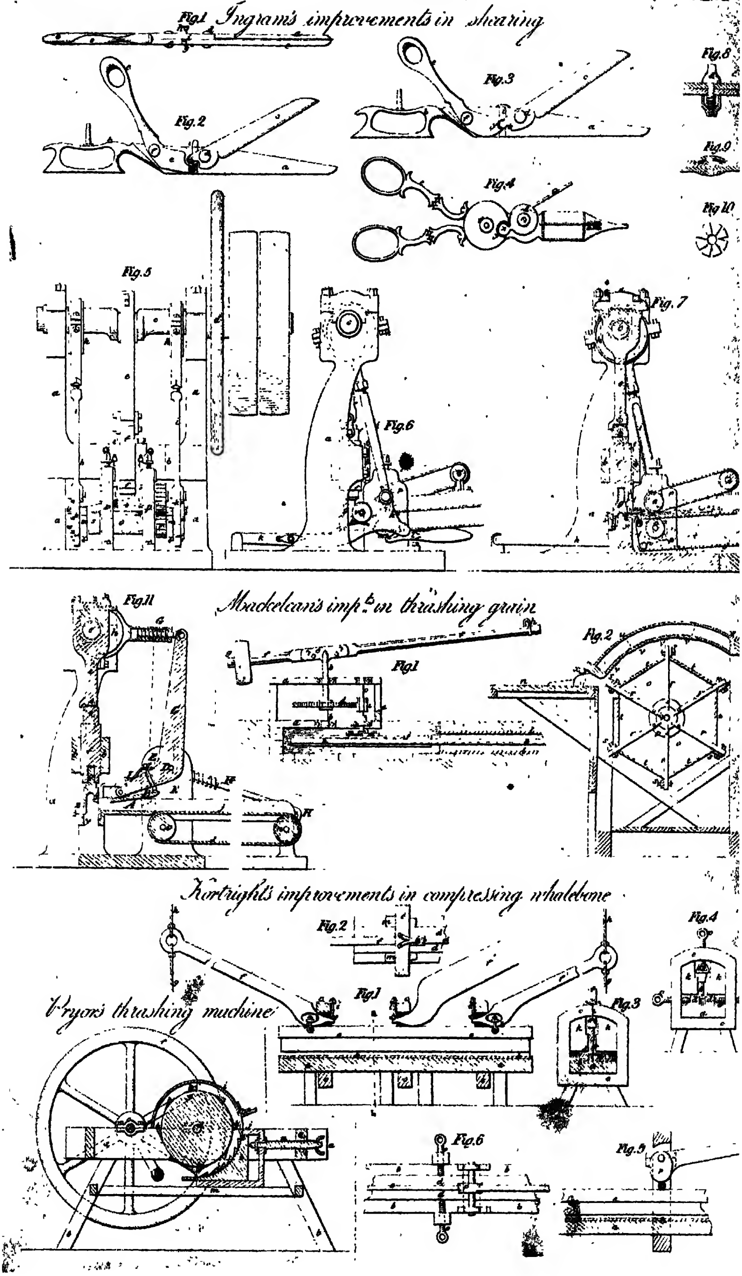
Fig.1 Ingram's improvements in shearing
Fig.2
Fig.3
Fig.4
Fig.5
Fig.6
Fig. 7
Fig.8
Fig.9
Fig.10
Fig.11
Mackelcan's impts. in thrashing grain
Fig.1
Fig.2
Kortright's improvements in compressing whalebone
Fig.1
Fig.2
Fig.3
Fig.4
Fig.5
Fig.6
Pryor's thrashing machine

THE

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CONJOINED SERIES.

No. CXXX.

Recent Patents.

To William Henson, *of Allen-street, Lambeth, in the county of Surrey, engineer, for improvements in machinery for making or producing certain fabrics, with threads or yarns, applicable to various useful purposes.*—[Sealed 19th November, 1840.]

These improvements consist in certain novel arrangements or constructions of machinery, whereby looped or knitted fabrics are produced, similar to those manufactured in the ordinary warp-frame, but in a more expeditious manner.

The fabrics may be used for a variety of purposes; for instance,—a close fabric may be produced, extending throughout the width of the machine, which may be afterwards cut up, and formed into various articles of dress; or it may be made in narrow widths, with selvages, for the purpose of being applied as surgical bandages, and for other purposes; or, when manufactured from woollen yarns, may be subjected to the operation of fulling or felting, in order to produce an appearance, resembling a closely woven woollen cloth. And also, by the same machine, open

or fancy work, such as is usually called " tattings," may be produced, if desired.

In his specification, the patentee's improvements are shewn, applied to the production of a closely-knitted fabric, extending along the whole width of the machine.

In Plate VI., fig. 1, is a front elevation of the machine, the top rail of the frame-work and work-roller, with its appendages, being removed, in order to expose such parts as lie immediately behind them; and fig. 2, is an elevation, shewing the right-hand end of fig. 1. Fig. 3, is a vertical section, taken transversely through the machine, in the line a, b, of fig. 1, looking towards the left-hand; and fig. 4, is a similar section, taken through the machine, in the line c, d, of fig. 1. Fig. 5, represents a detached portion of the machine, partly in section, taken in the line e, f, of fig. 1, looking towards the right-hand.

a, a, a, a, is the frame-work, by which the various parts of the machine are supported; *b, b,* is the main shaft, to which rotary motion is communicated from any suitable first mover, through the pulley *c.* This shaft carries the wheels or cams which actuate the working parts of the machine, hereafter to be described. *d, d,* is the warp-roller, on which the yarns or threads are wound, (intended to produce the knitted or looped fabric); and *e, e,* is the work-roller, on which such fabric is to be wound, as produced by the operations of the machine.

The parts connected with these two rollers, and the apparatus connected therewith, are more particularly shewn in the partial end view of the machine, at fig. 6.

The warp-roller *d, d,* is mounted, turning in bearings, affixed to the upper part of the frame-work of the machine; on the shaft of which, at each end of the roller, are affixed the ratchet-wheels 36, 36; on which shaft, the pullies 37, 37, are also mounted, but turning loosely thereon. 38, 38, are clicks or palls, turning on centres, formed by ears or lugs 39, 39, extending from the pullies 37, 37; which clicks or palls take into the teeth of the ratchet-wheels 36, 36.

Weighted cords 40, 40, extend over the peripheries of the pullies 37, 37, in order to give the required tension to

the warps or yarns, during the operations of the machine. As the roller *d, d,* revolves, in giving off its threads or yarns, to supply the operative parts of the machine, it carries round with it the fixed ratchet-wheels 36, 36, and, consequently, the clicks or palls 38, 38, and through them the loose weighted pullies 37, 37; but, in order to prevent several coils of the cords 40, 40, being formed around their peripheries, and thereby increasing the tension upon the threads or yarns, owing to each coil removing the weights further from the centre of the roller, the tails of the clicks or palls 38, 38, will, when the roller has performed a certain portion of a revolution, arrive in contact with the fixed stops or tappets 41, 41; by which means, they will be caused to turn upon their centres 39, 39, and thereby be liberated from the teeth of the ratchet-wheels 36, 36; when the weighted cords 40, 40, will turn the loose pullies 37, 37, round a portion of a revolution in the reverse direction, thereby uncoiling that portion of cord which has been wound up, the weights 40, 40, descending, until the clicks 38, 38, by means of their counter-balance weights 42, 42, again fall into the teeth of the ratchet-wheels 36, 36; and, in order that the weighted pullies 37, 37, may not receive a sudden check, when the palls 38, again fall into the teeth of the ratchet-wheels 36, 36, the surfaces of the wheels 36, and 37, are brought together by means of a tightening screw, in order to create a sufficient friction to allow the weight to fall gradually.

It will be perceived, that these appendages to the warp-roller are placed at each of its ends; and they are so arranged, that when the click 38, of one pulley 37, is liberated from the ratchet-wheel 36, the other has traversed but one-half of its extent of rotation, thereby causing the movement, for liberating the pullies 37, 37, and uncoiling the cords 40, 40, to take place at each end of the roller alternately.

The motion for taking-up the work on to the roller *e, e,* is effected in the following manner:—

43, 43, is a longitudinal bar, extending throughout the length of the machine, and is capable of moving up and

down in grooves or guides 44, 44, formed on the end frame-work of the machine, being supported therein by the work which passes under it, previously to being wound upon the roller *e*, as shewn in figs. 3 and 4.

The bar 43, is connected by means of links 45, to the lever 46, which lever, at one end, turns loosely upon the axis of the roller *e*, *e*, and at the other carries an anti-friction or truck-roller 47. As the work is produced, it allows the bar 43, 43, to fall, and, by means of the links 45, to carry the lever 46, with it, when the anti-friction or truck-roller 47, will be operated upon by the cam 48, on the main shaft *b*, of the machine, by which means the click or pall 49, mounted upon the lever 46, will act upon the ratchet-wheel 50, and thereby turn the work-roller *e*, round a portion of a revolution.

It will be evident, from this arrangement, that the work-roller will, at all times, have a motion communicated to it in proportion to the quantity of fabric formed; for, should the machine increase in rapidity of action, the bar 43, 43, will descend lower, and, carrying with it the lever ,45, allow the cam 48, to give an increased extent of motion to the click or pall 49, ratchet-wheel 50, and consequently work-roller *e*.—51, is a retaining click, for the purpose of preventing the work-roller from running back, when the pall 49, descends.

The yarns or threads pass from the roller *d*, through a stationary guide or sley *f*, affixed to the frame-work, and from thence through another guide or sley *g*, which receives motion, in the way hereafter described. *h*, *h*, are spools or bobbins, carrying the threads or yarns intended to form the selvage of the fabric;. and when the machine is adapted for making narrow pieces, they are to be placed, at intervals, along the front thereof.

i, *i*, *i*, *i*, are the series of needles, on which the threads or yarns are looped, in order that such loops, by interlacing between each other, may form the required knitted fabric. These needles are cast in leads, similar to those usually employed in warp-frames and other machinery of that class.

The leads of needles are attached, in the ordinary man-

ner, or by means of screws, to the bar *k, k,* which bar is connected to the shaft *l, l,* by the arms *m, m.* The pivots of the shaft *l, l.* are mounted in bearings, affixed to the levers *n, n,* which levers are keyed to the axis *o, o, o,* turning in plummer-blocks at *p, p.* Links *q, q,* are connected, at their front ends, to pivots or studs *r, r,* affixed to the back of the needle-bar *k, k,* and at their back ends, vibrate on centres *s, s,* attached to the standards *t, t.*

The front ends of the levers *n, n,* carry anti-friction rollers *u, u,* which are operated upon by cams *v, v,* upon the main shaft *b,* (see fig. 3.) These levers *n, n,* are also connected by means of the pins or axles, carrying the rollers *u, u,* to the upper parts of the yoke-pieces *w, w*; which yoke-pieces are, in like manner, connected below, to levers *x, x,* turning on fulcrum centres *x*, x*,* and carrying antifriction rollers *y, y*; which last-mentioned rollers are operated upon by the cams *z, z,* on the main shaft. (See fig. 1.)

From this arrangement it will be perceived, that by rotary motion being given to the main shaft *b,* the cams *v, v,* will cause the levers *n, n,* to rise, and with them the needle-bar and needles *i, i,* which, at the same time, will also raise the yoke-pieces *w, w,* and rollers *y, y.* On the further rotation of the main shaft *b,* the cams *z, z,* will come in contact with the rollers *y, y,* and bring down the yoke-piece and the levers *n, n,* and with them the needles *i, i, i,* to their former position.

There are a series of moveable guides 1, 1, 1, through which the yarns or threads pass; and by the movements of which they are lapped around the needles *i, i, i.* These guides, like the needles, are cast in leads, after the ordinary manner of those used in warp-frames. The leads are attached, by screws, to the bar 2, which is made fast to the shaft 3, by means of arms 4. At one end of the shaft 3, (see figs. 2 and 5,) a tail-piece 5, is affixed, carrying a stud 6, which stud works in the forked end of the lever 7. This lever turns upon a centre or fulcrum-pin 8, and is connected, at its lower end, to the yoke-piece 9. Another lever 10, vibrating on a centre at 11, below, is connected, at its up-

per end also, to the yoke-piece 9. Each of these levers is provided at 7*, and 10*, fig. 5, with anti-friction or truck-rollers, which are acted upon by the cams 12, and 12*, as the main shaft *b*, revolves.

By this arrangement it will be perceived, that the revolution of the cam 12, will move the lever 7, 7, on its centre at 8, and, by means of the stud 6, and tail-piece 5, communicate motion to the shaft 3, and guides 1, which will cause the yarns or threads to be passed between the needles *i*, *i*, in a direction from front to back. On the further revolution of the shaft, it will bring the cam 12, in contact with the roller 10*, and thereby move back the yoke-pieces 9, with the levers 7, and consequently carry the guides 1, 1, to their former position, that is, from the back toward the front of the machine. Previously, however, to this returning movement of the guides, the guide-bar 2, has received a lateral or shogging motion, by the following means:—

A spur-wheel 13, on the main shaft *b*, takes into another spur-wheel 14, on the short back-shaft 15,—see figs. 1 and 2. At the end of the shaft 15, there is a bevil pinion, taking into a similar pinion, on an upright shaft 16. At the top of this shaft 16, there is also a pinion, taking into another pinion, on a transverse shaft 17; upon which shaft is affixed the cam or cut-wheel 18. This cam works against an anti-friction roller 19, carried by the pendant-lever 20, in which lever is the set-screw 21, bearing against the end of the shaft 3.

It will now be seen, that rotary motion being communicated to the cam 18, through the train of wheels and pinions just described, the end of the shaft 3, will receive lateral pressure from the indentations or cuts upon the cam, and the spring 21*, at all times pressing against the other end of the shaft 3, and keeping it in contact with the cam 18, lateral or shogging movements will be occasionally given to the shaft, and consequently to the guides 1, 1, 1, according to the indentations upon the cam. By this lateral or shogging movement of the guides taking place, after the threads have passed between the needles, and previously to the guides and threads returning to their first position, the

loops or coils, for forming the meshes of the fabric, are produced round the needles; and it will be perceived, that the sley *g*, *g*, *g*, which keeps the threads separate, is attached to the guide-bar 2, and consequently partakes of all the motions applied to the guide-bar 2.

The presser-bar 22, at stated intervals, presses against the beards of the needles *i*, *i*, *i*, in a similar manner to the operation of such presser-bars, in the ordinary warp-machinery; and the means by which this is accomplished will be seen best in figs. 3 and 4.

A longitudinal shaft 23, extends throughout the width of the machine, turning in bearings, affixed to the end frame-work; on this shaft are fixed the arms 24, 24, which carry the presser-bar 22, capable of adjustment, by set-screws, as shewn in the drawing.

Two vertical levers 25, 25, are affixed, at their upper ends, to the shaft 23, carrying anti-friction rollers 26, 26, at their lower ends, which rollers are operated upon by cams 27, 27, mounted on the main shaft *b*, *b*.

Springs 28, 28, are fixed to the frame-work of the machine, and press, at their upper ends, against tail-pieces, extending from the arms 24, 24.

The rotation of the cams 27, 27, operating upon the rollers 26, 26, of the levers 25, 25, will turn the shaft 23, round a portion of a revolution, thereby bringing the presser-bar 22, forward, into contact with the beards of the needles *i*, *i*, *i*, the springs 28, 28, returning it to its former position, when allowed to do so by the further rotation of the cams 27, 27.

A series of instruments 29, 29, called hooks or crutches, (supplying, in some respects, the place of "sinkers," employed in the ordinary warp-frame, as will be hereafter explained,) are cast in leads, in the same manner as the guides and needles. Each hook or crutch is placed opposite to a space between the needles. The leads of these hooks are attached, by screws, to the longitudinal vibrating bar 30, which is mounted upon the rocking-levers 37, 37. These rocking-levers carry anti-friction rollers 32, 32, against which the peripheries of the cams 33, 33, act, as the shaft *b*, re-

volves; and there are springs 34, 34, attached, at their upper ends, to the frame-work of the machine, their lower ends pressing against adjustable screws, attached to the hook or crutch-bar 30. By these means the crutch-bar has a constant tendency to press inwards or towards the back of the machine; and at a certain period of the rotation of the cam 33, an indentation on its periphery is brought opposite the roller 32, when a backward movement of the hook or crutch-bar takes place, as will be seen in the general operation of the machine.

A longitudinal bar 35, attached to the hook or crutch-bar 30, forms a breast-beam, over which the manufactured fabric passes, on its way to the work-roller *e*, *e*.

The operations of the machine are explained, as applied only to the manufacture of one particular fabric; yet it will be obvious to all persons conversant with warp-frames, and a similar class of machinery, that the lapping of the yarns or threads may take place in a variety of forms, depending only upon the cut of wheels for racking the guide-bar; and, if desired, extra guide-bars may be introduced, for the purpose of forming ornamental, open, or other fabrics, each guide-bar being supplied, as is well understood, with a respective cut of wheels, to produce the required shogging motions.

These actuating wheels may be mounted on the shaft 17, in a similar manner to that one shewn in the drawings; or they may be carried by a frame, which vibrates with the shaft 3, 3; in the former case, however, the ends of the guide-bars must be made sufficiently broad to prevent them getting out of contact with their shogging-wheels, when in the act of vibrating, in order to pass the threads or yarns through the needles. By these means, certain descriptions of fabric, usually denominated tattings, may be produced, and a variety of similar kinds of articles, which will readily suggest themselves to a competent manufacturer.

In order to explain one mode, by which the loops or laps may be so interlaced, as to produce the required knitted fabric, a series of diagrams are shewn, which represent the various positions the guides will assume, with regard to the

needles. The needles, in these diagrams, are described by circles;—the oblong figures represent the guides, which carry the yarns or threads.

Supposing the parts to be situated as represented in the enlarged detached sectional view of the working parts, fig. 7, the guides 1, being in the front of the machine, and situated, with regard to their respective needles, as at No. 1, in the previously-mentioned diagram, (see fig. 1,) the roller 19, being in contact with the point A, of the cam 18, shewn in the same figure, and on an enlarged scale at fig. 14,—a further revolution of the cam 18, will allow the roller to fall on to that portion of the periphery of the cam marked 1, thereby racking or shogging the guides one space to the right, and bringing them into that position shewn in the diagram No. 2, during which time, by the action of the cams *v*, *v*, the needles have been raised into the position shewn in fig. 8.

The next operation of the machine, is passing the guides between the needles, towards the back of the machine, which is effected by the prominence on the cam 12, coming in contact with the roller 7*, on the lever 7, thereby turning that lever on its centre, and giving a vibratory motion to the guides, as before described,—this operation bringing them into the position shewn at No. 3, diagram, and in the detached view, fig. 9.

The cam 18, by means of its elevated part 2, now racks the guides one space to the left, bringing them into the situation shewn in diagram No. 4, when the guides are immediately again passed through the needles, to the front of the machine, into the position shewn at diagram No. 5, by which means the threads or yarns have become lapped round their respective needles.

During this time the needles have been gradually rising into the position shewn in the detached fig. 10; after which, and during the passage of the cam 18, through its division 2, they again begin to fall, the presser-bar 22, by means of its cams 27, 27, being made to advance towards the needles, as shewn at fig. 11. By reference to this figure, it will be seen, that the lap or coil, formed as before described, is now

within the beard of the needle, and that loop, produced by the working of the last course, is situated underneath it, and still held on the needles.

The presser-bar is now further advanced, and the needles brought lower down, into the position shewn at fig. 12, where it will be perceived, that the laps last formed are at the top of the needles and under their beards, while those loops, produced by the previous course, are allowed to pass over them, the presser-bar 22, having pressed the beards of the needles into their eyes or recesses, owing to the hook or crutch-bar 30, moving a short space towards the back of the machine, which allows the presser-bar to come forward. The presser-bar now returns to its former situation, and the needles descend from their position, fig. 12, into that shewn at fig. 13, by which the last loops are drawn through the former, thereby causing them to interlace each other, as is well understood by all persons conversant with warp-machinery.

The crutch-bar now comes forward to its first position, bringing the hooks of the crutches over the work, and carrying the work forward, free from the needles, which operation brings the working parts again into the starting position, represented at fig. 7. Another course is now commenced, which only varies, from that last described, in the motions of the guides; for it is in this instance necessary, in order to interweave a loop, formed by one thread, into a loop, formed by another thread, that at the next course of working, each guide should lap or coil its thread round a different needle from that round which it lapped its thread before; in this case, the next needle is the one which the guides are intended to travel round. To effect this, the guides are now racked or shogged, by the stop on the cam 18, marked 3, one space to the left, and brought into the position shewn in the diagram No. 6. The guides now pass to the back of the machine, into the position shewn at diagram No. 7; during which operation the needles, as before described, have risen to the position shewn in the detached fig. 8. The division 4, of the cam 18, then racks the guides one space to the right, bringing them into the

situation shewn in the diagram No. 8, when they pass to the front of the machine, and regain their starting position, shewn in the diagram at No. 1, and in fig. 7, when the same operations again take place, the hooks or crutches extending over the finished work, and preventing it from ascending when the needles pass upwards.

It will be perceived, by reference to the diagrams, that one needle, at each end of the series, is removed, their removal causing the outside threads, which are supplied from separate bobbins *h*, *h*, (see figs. 1, 3, and 4,) to form but one mesh or loop, while each of the others is producing two meshes. The outside needles being removed, the outside guides will only form one loop, while every other guide is forming two; that is to say, there will only be a loop formed by the end guides, ready to be taken down through one formed by its adjacent guide, at every other course, so that the end loops will be interlaced, and tie together those constituting two courses of meshes or loops.

The outside guides of each breadth not having two needles to coil the thread around, can only form their loops around the first needles; or, in other words, (making only one course of work for two motions, and these single loops,) will, in course of working, be regularly interlaced with the double loops, formed by the double courses or movements of the other guides, and thus form a fast and tight selvage, the different courses being connected together in a longitudinal direction, as must be well understood by all persons conversant with this kind of manufacture.

The patentee claims the novel construction, combination, and arrangement, of the parts or agents used for producing the fabric, constituting a novel machine, together with the movements and operations of the several parts thereof, suitable for forming or manufacturing looped or knitted fabrics; the character of which fabric may be varied to a great extent, by giving different motions to the parts or agents above described, by means of different cuts of wheels, or shapes of the actuating cams, without deviating from the general features of the novel arrangement of ma-

chinery, as will be readily seen by any competent manufacturer acquainted with machinery of this class or description; that is, such as are commonly known and used for producing looped or knitted work.—[*Inrolled in the Petty Bag Office, May,* 1841.]

Specification drawn by Messrs. Newton and Son.

To MILES BERRY, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, civil engineer, for an invention of improvements in the construction of locks, latches, or such kind of fastenings, for doors and gates, and other purposes to which they may be applicable,—being a communication.*—[Sealed 14th July, 1841.]

THESE improvements, in the construction of locks, latches, and other similar fastenings, consist in a peculiar arrangemen of parts, whereby a lever-plate, constructed and adapted on the plan hereinafter described, will answer all the purposes of a lock, bolt, and latch.

In Plate VII., fig. 1, is a horizontal section of a door, exhibiting the situation of the lever-plate *a, a,* in the mortice *b, b,* of the door *c, c.* Fig. 2, is a side view of a portion of the door, the latch-knob and bolt-knob being removed, and the situation of the lever-plate *a,* indicated by the dotted lines. Fig. 3, represents the edge of the door *c,* with the mortice *b,* and plate *a,* within it. The lever-plate *a,* in these last two figures, is in the position it would occupy when the latch only is intended to be used.

It will be seen, by referring to figs. 1 and 2, that when this apparatus is employed as a simple latch, the lever-plate *a,* having been thrown back, remains entirely within the mortice *b,* in the substance of the door, a small notch or opening *d,* having been cut away in the edge of the door, as shewn at fig. 3, in order to admit the hasp or catch *e,* which projects from, or is attached to, the jamb *f,* as seen in fig. 1.

The pin *g,* of the latch-knob *h,* forms the fulcrum on which the lever-plate *a,* works; and as the end of the lever

a, comes into contact with the inclined plane of the catch *e*, (in the act of shutting the door,) it is raised into the position shewn, by dots, in fig. 4; and when the door closes, she edge of the lever-plate falls down behind the notch of the hasp *e*, and the door becomes fast.

When it is required to bolt the door from the inside, the plate *a*, must be raised, by means of the bolt-knob *k*, fixed upon the pin *i*, which is inserted into the plate *a*. By means of this knob *k*, the plate is to be projected into the socket or mortice, made in the door-jamb *f*, which is done by passing the pin *i*, of the bolt-knob, into the second notch of the aperture *m*, cut in the lining of the mortice *b*, which notched aperture is shewn in figs. 1 and 2.

An oblong slit or opening *n*, is made in the hinder part of the lever-plate, for the purpose of allowing it to slide longitudinally upon the pin *g*, when the plate is projected, as described, into the jamb of the door, in the act of locking or bolting the door.

The plate may also be shot forward to the same distance from the outside, by means of a small key, inserted in the outer side of the door, as shewn at *l*, in fig. 1,—the tongue of this key acting against the notch *p*, cut in the under part of the plate, as shewn by dots in fig. 2, the rotation of the key raising and projecting the plate forward.

If desired, the plate *a*, may be shot forward still further into the mortice of the door-jamb *f*, by passing the pin *i*, of the bolt-knob, into the third notch of the aperture *m*. This, however, cannot be done, without previously removing the key from the key-hole on the outside of the door; but when the plate has been thus shot forward from within, it cannot be brought back again by any other means than by raising the bolt-knob *k*, and sliding it back, as the solid part of the plate, when projected, will be in front of the key-hole, and thereby prevent the key being inserted.

The patentee claims the improved construction of latch, lock, or other fastening, above described, in which one simple plate of metal is made to answer the threefold purpose of latch, bolt, and lock.—[*Inrolled in the Petty Bag Office, January*, 1842.]

Specification drawn by Messrs. Newton and Son.

To George Mannering, *of Dovor, in the county of Kent, plumber, and* Henry Harrison, *of Ashford, in the same county, plumber, for their invention of certain improvements in the means of raising water and other fluids.*—[Sealed 8th September, 1841.]

This invention of improvements, in raising water and other fluids, consists in certain improved methods of constructing, the internal parts of pumps, whereby they may be made with less labour, and will work more easily than pumps of the ordinary construction.

The improvements consist in applying or adapting a narrow annular or other stationary metallic or other packing, to the inside of the pump-barrel, in which stationary packing, an accurately fitted bucket works. This bucket may be made of metal or other suitable substance, but metal is preferred, as it will last longer than any other material. The external face of this bucket is very accurately ground or turned to a perfectly smooth surface, and the packing, in which it works, is attached to the inside of the pump-barrel or cylinder, in any convenient manner.

In Plate VII., fig. 1, represents a transverse vertical section of one of the improved pumps, for ordinary purposes. The pump cylinder-barrel or casing, may be made of wood, lead, cast-iron, brass, or other suitable material.

The pump-barrel casing or cylinder, may be taken just as it comes from the foundry, and requires little or no internal preparation for the reception of the annular packing, which may be either screwed down or otherwise secured on to a projecting piece, cast in the interior of the cylinder for that purpose, or attached to the flange, by which the upper and lower parts are fastened together.

The bucket, plunger, or piston, is a metallic cylinder, and its external surface is accurately ground or turned, to fit the annular packing, which is shewn detached in figs. 2 and 3.—Fig. 2, being a section of a metallic packing, consisting of segments of brass or other metallic rings; and fig. 3, a similar view of a packing, made of a ring of cork,

enclosed between two metal rings, and made to pack closely against the sides of the plunger, bucket, or piston, by screwing up the metal rings, and, by that means, forcing out the cork, and making it press against the said buckets, piston, or plunger.

Fig. 4, is a sectional view of a lift-pump, or that description of pump usually employed in mines and deep wells, with the invention applied thereto. Fig. 5, is a similar view of a double-action ship's pump, constructed according to the improvements. Fig. 6, is a section of part of a pump, on an enlarged scale, in order to shew the parts more clearly.

a, a, is the pump-barrel; the cylindrical bucket, piston, or plunger, is shewn at *b*, and is worked by means of the rod *c*, and handle *d*. The annular metallic or other packing *e, e,* is fastened by screws, or otherwise, to a projecting piece, cast on to, or attached to, the sides of the pump-barrel, as before described; *f*, is the valve, which admits water into the pump-barrel, as the piston, bucket, or plunger, rises; and *g*, is another valve, opening outwards, and connected to the bucket, either at the upper part or in any other convenient situation, as is well understood by all plumbers. The cylindrical piston is made about the length of the required stroke.

Different methods of applying the packing to the interior of the pump-barrel, are shewn in figs. 1, 4, and 5, already alluded to; and as the methods of doing this are evident in the drawings, a further description is unnecessary.

The patentees do not confine themselves to any particular method of attaching or applying the metallic or other packing to the interior of pump-barrels, nor to the material of which the said packing is composed, but they claim, first, forming the plunger, bucket, or piston, (cylindrical or otherwise,) of sufficient length for the required stroke; and secondly, the novel mode of applying the packing, by its forming a part of the barrel, or being attached thereto, in any convenient manner, as above described; which packing may be annular or otherwise, according to the shape of the piston.—[*Inrolled in the Petty Bag Office, March,* 1842.]

Specification drawn by Messrs. Newton and Son.

To George Allarton, *of West Bromwich, in the county of Stafford, surgeon, for certain improvements in the method of balling and blooming iron.**—[Sealed 11th November, 1841.]

According to the ordinary method of making iron, as soon as the puddled balls or ball furnace piles are taken from their respective furnaces, they are subjected to the operation of hammering or squeezing, by which they are freed from cinder, and reduced to blooms, slabs, &c., as desired. The squeezers, generally employed for this purpose, consist of a lever, worked by a crank or cam, attached to the machinery. The bedding or foundation of these squeezers is effectually secured from lifting up or moving, by various contrivances; so that, in the event of great resistance from the iron becoming too cold, or from any other cause, some portion of the machinery must inevitably break, occasioning expense and delay. From this liability to breakage, the utility of the squeezer is much lessened, as a sufficient power cannot be obtained without risk.

To remedy this defect, the patentee provides a relief, which enables the machine to be so adjusted as to exert any given or required amount of pressure, (say from 100 to 1000 tons,) with perfect safety; and in the event of a greater resistance occurring than that to which it is adjusted, the whole machine lifts up from a joint or hinge, at the extremity of the bed-plate, and thus prevents any breakage.

In consequence of the great pressure required, the motion is necessarily slow,—thus an advantage is given to the workman in turning about his bloom or slab. Tools, so constructed as to prevent the iron eluding the grasp of the squeezer, can be used, by which the bloom is sooner completed, and the iron may be rolled whilst quite hot.

In Plate VII., figs. 1 and 2, are side views of the machine, in two positions. *a, a,* is the cast-iron bed-plate,

* Since the granting of this Patent, the Patentee has entered a Disclaimer to part of the Title, the effect of which is, that it now stands for "Blooming Iron" only.

with a long slot or forked opening in its hinder part, to allow the tail of the lever *b*, to work up and down through it. Upon this bed-plate are fixed two standards *c*; one only of these can be seen in the side elevation. Through eyes, in the standards *c*, a strong wrought-iron pin *d*, is passed, which constitutes the axle or fulcrum of the lever *b*.

On the bed-plate is placed a carriage or bearing *e*, for the anvil *f*, to rest upon; and several (say four) cast-iron weights *g*, *g*, of at least five tons each, are also placed, to press the bed down. At the front part of the bed-plate, on each side, there extends a gudgeon or pin *h*, held down to the foundation by strong wrought-iron loops *i*, bolted to the masonry. These gudgeons *h*, *h*, constitute a fulcrum or hinge-joint, on which the bed-plate may rise as a lever, but do not admit of its being displaced laterally.

In fig. 1, there are represented two pieces of hot iron or blooms, of compressible iron, under the jaw of the squeezing lever *b*, which lever will, when worked up and down upon its fulcrum-pin, compress the blooms of iron upon the anvil *f*, into the required shape. But when the iron is in a cold state, as the piece represented under the jaw of the lever *b*, in fig. 2, the incompressibility of the iron, in that state, prevents the jaws from coming down upon the anvil. In this case, the certain and uniform force applied to and acting against the tail of the lever, in the ordinary mode of working it, would, from the resistance of the incompressible piece of iron, cause some part of the machine to give way or break; but that, by the bed itself, being permitted, under this extreme force, to rise, as shewn in fig. 2, the strain upon the machine is relieved, and no fracture is likely to take place.

The patentee remarks, that although he has described the particular machine now at work, and which has been at work for some months, blooming iron at the rate of about 150 tons per week, without the slightest accident or breakage, and without any additional expense to its original cost; yet he does not intend to restrict himself to the particular form of lever and its appendages, shewn in the drawings, as that might be varied without deviation from the prin-

cipal feature of novelty, which constitutes the invention; nor does he limit himself to any precise mode of actuating the compressing lever, either by cam, tappet, or crank, nor to the precise mode of counter-balancing and regulating, by weights, the amount of pressure at which the relief shall come into operation; nor to the particular form of joint or hinge employed to raise the bed upon, provided the object of the invention be effected; but what he does claim, as the principle of his invention, is the means of adapting such machinery to sustain any required amount of pressure, (however great,) with perfect safety.—[*Inrolled in the Petty Bag Office, May,* 1841.]

Specification drawn by Messrs. Newton and Son.

To ISAAC DAVIS, *late of New Bond-street, in the county of Middlesex, but now of the Poultry, in the city of London, optician, for his improvements in the manufacture of sealing-wax, which compounds are applicable to other useful purposes.*—[Sealed 11th November, 1841.]

THESE improvements, in the manufacture of sealing-wax, consist in forming the wax into small sticks, each of which may contain a sufficient quantity for one seal; or the stick may be made long enough for two seals, and have a cut in the middle, to divide it. To the end of each single stick so formed, or to the outer ends of the double stick, a detonating, combustible, or highly inflammable substance, is to be attached, which may be ignited by friction, or by bringing it into contact with acid, or by any other known means, by which such highly inflammable compounds can be made to ignite, so as to set fire to the stick of wax to which it is attached.

In Plate VII., fig. 1, represents one of the small sticks of wax, for sealing notes, and the detonating or highly combustible composition at the end. Figs. 2, 3, and 4, shew convenient forms of holders, in the clips of which, one of

the small sticks of wax may be held while igniting and using them for sealing. Fig. 2, is a common clip-holder, having a piece of sealing-wax held in it. Fig. 3, represents a more ornamental holder, having a seal at one extremity. In this holder, the forceps or clips are slidden in and out, as in an ordinary pencil-case, and the jaws of the forceps are made to collapse, and hold the end of the stick of wax, as shewn, by sliding up a small ring *a*, connected to the forceps. Fig. 4, represents another construction of holder, the upper part of which constitutes spring-clips, for holding the stick of sealing-wax, by sliding up the ring *a*. When the stick of wax has been melted in these clips, and the letter sealed, it will be necessary to discharge the remaining small piece of wax from the clips, which may be done by pushing up the sliding shaft *b*.

The apparatus, for making these small sticks of sealing-wax, is shewn in figs. 5 and 6.—Fig. 5, is a transverse section of the apparatus, and fig. 6, a perspective view of the same. This apparatus consists of two metal plates A, and B, connected together by a hinge-joint, having a number of semi-circular or other shaped grooves, so formed in each, that they may be coincident when brought together, which is done by bringing down the handle C, the grooves in the two plates, when united, forming cylindrical or other shaped moulds or recesses.

The bottom plate A, is to be secured to a bench or table, by screws, bolts, or otherwise; and the upper plate B, turning on the hinge-joint *a*, *a*, is moved by the handle C.

The apparatus is used in the following manner:—The plates being in the open position shewn in fig. 5, a sufficient quantity of wax, melted or softened into a fluid or semi-fluid state, in any convenient manner, is placed on the lower plate A, A, when the upper plate B, B, is brought down with force on to the wax, by means of the handle C, as before said, into the closed position shewn in fig. 6. By these means, the wax becomes moulded into the proper forms, and when removed from the apparatus, the sticks, if adhering together, may be readily separated. After this, the detonating, combustible, or highly inflammable chemi-

cal compound, is applied in a fluid state to the ends of the sticks, by dipping them into the fluid compound, or in any other convenient manner.

The upper or moveable plate B, is divided, longitudinally, into compartments, by the insertion of a thin plate of steel or other metal *b, b,* placed there for the purpose of cutting the lengths of wax in their middle, so as to produce sticks of the desired lengths. This thin plate *b, b,* forms a nick on each stick, as seen in fig. 8; and when the wax is removed from the apparatus, it is easily broken into the proper lengths.

For the convenience and economy of forming a very considerable number of these small sticks of sealing-wax, at one operation, a larger and more powerful apparatus is sometimes employed, as represented in the drawing, at fig. 7. This apparatus consists, as before, of two grooved plates A, and B, the moveable plate being raised and lowered by a long powerful lever C, In this instance, there may not only be a greater number of flutes in the plates, but the plates may be sufficiently broad to mould small sticks of wax of any required lengths, and may be divided, transversely, into compartments, by the insertion of cutting-slips or ribs *b, b,* as before described, so as to nick or separate the sticks of wax into the short lengths required.

Instead of using a detached holder, as shewn, the ends of two of the small pieces of sealing-wax may be inserted into a tube, made of reed or quill, or some other suitable material, as shewn at fig. 8. In this case, the small pieces of wax are cast into the tubes, and for that purpose, the apparatus, shewn at figs. 9 and 10, is employed.

Fig. 9, is an elevational section of the two fluted or grooved plates A, and B, with the block D, and pressing lever C.

Fig. 10, is a horizontal view of the grooved plate A, along the middle of which, in a row, the reeds or quills are placed, one in each groove. Upon these the fluted bar E, is laid, for the purpose of holding the reeds securely in their positions. The soft wax is then spread upon the plate, on each side, at the ends of the reeds; and the block D, with

the upper plates B, B, is brought down by the lever C, and pressed with great force, which causes some of the wax to enter the ends of the reeds and adhere thereto, as shewn at fig. 8.

The patentee claims, firstly, making sealing-wax in small sticks, each stick consisting of only a sufficient quantity of wax to form a single seal, or it may be a double stick, having a nick or cut in the middle, or nicks in several places, for separating them; and also applying an inflammable, detonating, or highly combustible compound or substance, to the ends of such sticks of sealing-wax, in order that they may be ignited by friction, or by any other suitable means, as above stated.

Secondly.—The adaptation of small tubes of reed or quill, as holders for the said small sticks of sealing-wax, and the peculiar construction of holder, shewn at fig. 4, for the same purpose.

Thirdly.—The pressing apparatus, herein shewn and described, for the making or manufacturing sticks of sealing-wax; but he does not confine himself to that particular construction of apparatus, in making such sticks of sealing-wax, as they might be made by other forms of machines; but he claims the forming, by moulding, sticks of sealing-wax under pressure, which produces a beautiful form and gloss or polish on its surface; and—

Lastly.—The other purposes to which part of the said invention applies, is the adaptation of the said highly inflammable chemical compound to the ends of cigars, in order to enable them to be ignited by similar means to those above described.—[*Inrolled in the Petty Bag Office, May,* 1842.]

Specification drawn by Messrs. Newton and Son.

To James Colman, *of Stoke Holy Cross, in the county of Norfolk, starch manufacturer, for improvements in the manufacture of starch.*—[Sealed 9th December, 1841.]

The first part of these improvements consists in manufac-

turing starch from maize or Indian corn. The Indian corn is first softened, by soaking in water for three or four days; it is then reduced to a pulp, by means of rollers, and allowed to remain in a vessel, until the fermentation has separated the starch from the other matters,—this will be in about twelve or fifteen days. The starch is then washed through sieves, and finished in the usual way of manufacturing wheat starch.

In place of simply fermenting the Indian corn, the process of separating the gluten and other matters may be performed by means of a dilute caustic alkali, in the following manner:—Fifty-six pounds of Indian corn, reduced to a pulp, as above, are mixed with fifty-six gallons of a solution of soda or potash, (containing two hundred grains of soda or potash to the gallon,) and allowed to remain for three days, being stirred every three hours. At the end of this time, the mixture is allowed to remain without stirring, for eighteen hours, and then the liquor is drawn off; after this, another solution, of only half the strength of the former, is added to the Indian corn, in the proportions above-mentioned. This mixture is stirred every three hours, during the period of two days, and then, after settling for eighteen hours, the liquor is drawn off, and the starch finished in the ordinary manner.

Instead of the modes just described, for separating the gluten and other matters from the starch, a solution of an alkaline salt may be used, such as the carbonate of soda or potash; or acid may be employed, in the way hereinafter described, with respect to manufacturing starch from rice.

The second improvement consists in the manufacture of starch from barley. The barley, after being ground into flour, is caused to ferment, by the addition of water, and at the end of ten or twelve days, is washed through sieves, and subjected to the same process as that adopted for manufacturing starch from wheat.

Another mode of effecting this improvement, consists in soaking unground barley in water, for four or five days, and after reducing it to a pulp, allowing it to ferment for

ten or twelve days in a vat; the starch is then washed and finished.

The gluten and other matters may also be separated from the starch, by means of dilute caustic alkali, or a solution of alkaline salt, or an acid, as before-mentioned, with respect to Indian corn.

The third improvement consists in making starch from rice, by the aid of the refuse of wheat and other grain, or some woody fibrous matter. The rice is first softened, and reduced to a pulp, in the same manner as the Indian corn, and is then mixed with the refuse of wheat, in the proportions of from twelve to fifteen pounds of the latter to every cwt. of rice. This mixture is allowed to ferment for about twelve or fifteen days, and at the end of that time the starch, having separated from the other matters, is washed through sieves and finished.

The fourth improvement consists in extracting starch from rice, by means of an acid. The rice having been softened and reduced to a pulp, is allowed to settle, and the water on the top is drawn off by a syphon. A solution, containing three quarters of an ounce or an ounce of acid (muriatic acid is preferred) to a gallon of water, is then added to the rice, in the proportions of one gallon of the former to two pounds of the latter. In this state the rice is allowed to remain for five days, being stirred every four hours; it is then left to settle for eighteen hours; after which, the water is drawn off at the top, and another solution, only two-thirds the strength of the former, is mixed with the rice. This mixture is treated in the manner just described, and the starch produced is washed through sieves, and finished by the usual process.

The patentee claims, First.—The mode of manufacturing starch by the application of maize or Indian corn, by means of one or other of the processes described.

Secondly.—The mode of manufacturing starch by the application of barley, by means of one or other of the processes described.

Thirdly.—The mode of manufacturing starch by fer-

menting rice, by the aid of the offal of wheat or other grain, or some woody fibrous matter; and—

Fourthly.—The mode of manufacturing starch from rice, by the application of an acid, as above-described.—[*Inrolled in the Inrolment Office, June,* 1842.]

To Edward Henshall, *of Huddersfield, in the county of York, carpet manufacturer and merchant, for certain improvements in making, manufacturing, or producing carpets and hearth-rugs.*—[Sealed 26th January, 1841.]

These improvements, in manufacturing carpets and hearth rugs, consist, Firstly.—In the application and use of a peculiar and novel arrangement of apparatus, designed for the purpose of winding the threads or yarns which are to constitute the warp-threads of Brussels, Wilton, velvet, or velvet piled, or other similar carpets and hearth-rugs, from separate hanks of yarn, and laying two, three, or more threads, side by side, as if in tapes or bands, upon one bobbin, and thus preparing the threads for a two or three-thread warp, before they are placed in the loom for weaving.

Secondly.—The invention consists in an improved construction of apparatus, and a novel mode of operation, as well as the peculiar arrangement of the yarns which are to constitute warp-threads, whereby spots, squares, or stripes, may be printed upon a flat surface or table, by means of any ordinary block or type printing apparatus, in different colors, across a collection or number of yarns or threads, so arranged, that they may, after being so printed upon the table, be wound again upon a reel into hanks, then taken off the reel, and removed to be steamed, washed, and dried, in order to clear, raise, or fix the colors, as in the ordinary process of printing woollen yarns.

It must be observed, that each spot, square, or stripe, may be printed or stamped of any breadth of the block, or length of the threads or yarns, according to the pattern required, as the portion of the yarn so printed or stamped,

is intended to form one or more loops of the fabric, when thrown up by the weaving; that is to say, if two or more loops, in succession, are required to be of the same color, to form the pattern of the carpet, the threads or yarns must be printed or colored at once, over a sufficient space of the length, to form these two or more loops; this may be done with a block or type of the required breadth or length for two or more loops in the cloth, hereafter more particularly explained.

The object of this part of the invention, is in a better and more ready manner than has heretofore been done, to operate upon a greater number of threads or yarns, and produce the printed, or stamped, spotted, or striped yarns, direct from the bobbins; and after printing or coloring, to wind them at once direct from the printing table into separate hanks, all of which is done at one operation. These warps, when subsequently arranged, form the warps of as many carpets or hearth-rugs, in contra-distinction to printing, stamping, or coloring the yarns collectively, when arranged in the form of a warp, with a pattern or device complete upon the surface of such warp, and ready to be woven in the loom, as hitherto practised under the patented inventions of Messrs. Woodcroft, Schwabe, Whytock, and Whytock and Clink; the first two persons printing or dyeing the intended pattern or device complete upon the perfect or arranged warp, either before or after beaming; and the latter, either printing on yarns, wound on a cylinder, or producing the colors by dyeing part of the said yarns.

When the threads or yarns have been so printed, they are properly arranged, as hereafter described, in order to form the warp-threads of carpets and hearth-rugs; they are then woven in an ordinary carpet loom, and the intended pattern is produced, merely by throwing up those parts of the threads which have been previously printed or stamped, and arranged so as to form the pattern, without the assistance of the Jacquard or any other figuring apparatus. This part of the invention also comprises the arrangement of the threads, and the apparatus connected therewith.

Thirdly.—These improvements consist of a novel arrangement of machinery, by means of which, the warp, yarn, or threads, or warp throughout its whole length, can be woven into a slight gauze-work, having weft-threads put in at distances of about an inch asunder; and this is done during the operation of beaming the warp direct from the bobbins,

After the warp-yarn has been thus prepared, patterns or designs may be printed upon its surface, in the ordinary manner of block printing.

In printing the gauze, the pattern-blocks must be elongated when intended for Brussels or similar carpets or hearth-rugs, as before named; and this is accomplished by providing the block, upon which the pattern is wrought, about three-fifths longer than the finished pattern will require, when the cloth is completed, as the operation of weaving will weave, or use up, or loop up, the extra three-fifths of printed gauze. The gauze, when printed, is removed to be steamed, washed, and dryed, in the ordinary manner of woollen printing; after which, it is re-beamed, and woven in an ordinary plain carpet loom, the preparatory weft-threads of the gauze, being removed as the cloth is woven.

Fourthly.—The improvements consist in weaving, in a common simple loom, Brussels or similar carpets, or looped fabrics, as Wilton or velvet piled carpets and hearth-rugs, plain, either in white or grey yarn, or any color, intended as the ground of the pattern; and afterwards printing upon the said plain goods, any pattern or device, in the ordinary manner of block or machine printing, the color parts of which may be raised, washed, and dried in the usual way. The carpet is then distended, and the back stiffened with size or other suitable matter, as may be found requisite.

In Plate VIII., fig. 1, represents a front elevation of an improved winding apparatus, constituting the first part of the improvements; fig. 2, is an end view; and fig. 3, is a plan or horizontal view of the same, as seen from above. These figures will be sufficient to illustrate two methods of carrying this part of the invention into effect, viz., doubling from hanks, or skeins, or separate bobbins, as one side of

the frame is represented having the hanks or skeins, and the other the bobbins.

The machine consists of a slight frame *a, a, a,* the upper part of which supports the reels *b, b, b,* containing the hanks of yarn *c, c, c.* The lower part of the framing supports the driving-shaft *d, d,* upon which is keyed the pulley *e,* to which driving-power is to be applied. Upon this shaft *d,* a series of wooden drums *f, f, f,* are also mounted, which revolve with it, and drive, by friction of contact, the bobbins *g, g,* and *m, m.*

The yarns or threads being taken separately from the hanks, two, three, or more of them are brought together, and passed through the eyes *h,* in the stationary guide-rail *i, i*; thence through the eyes *h*, h*,* on the traversing guide-rail *i*, i*.* These threads are then wound upon one of the bobbins *g,* side by side, so that the two, three, or more, will readily unwind from the bobbins, at the same speed, and thus always preserve an uniformity, in length and tension.

The guide-rails *i*,* are traversed to and fro, in order to lay the yarn evenly upon the surfaces of the bobbins, by means of the lever *k,* being moved by the heart or excentric motion *l,* geared with the other end of the driving shaft.

It will be observed, by the drawing, that a similar arrangement is represented upon the other side of the machine, except that the three threads are being wound together upon the bobbin *m, m,* from off bobbins *n, n,* instead of the reels *b, b,* or hanks *c, c.*

The apparatus necessary to perform the second part of the improvements, namely, the arranging, printing, or stamping, and reeling of the threads or yarns, intended to be woven into carpets or rugs, is shewn in longitudinal elevation at fig. 4.

Any number of bobbins containing the yarns, are placed at *a, a,* upon spindles mounted (either vertically or in any other manner) in the boards *b,* as a creel, the yarns from which are passed between the friction guide rollers *c, c,* and one two or more threads (according to the quality of the carpet required) are drawn through each space of the wires

in the sley or reed *d*,—say ten or twenty of such threads are passed through the reed, side by side, and form a band; a space or blank, of about the same width as the band of yarns, is then left in the reed; and again, a similar number of threads and spaces are left alternately, until the reed is filled. The ends of all the threads are then to be confined in a nipper or clasp *g*, and drawn tightly across the printing or stamping table *h*. The operation of ordinary block-printing or stamping, is now to be performed, which must be governed by the pattern paper, as in ordinary figure weaving; spots, stripes, or squares, only, are to be printed or stamped, and not any regular fancy pattern or device.

It will be necessary to have an ordinary squared or plaid pattern paper, every square or plaid of which corresponds with each two or three threads of the intended carpet; and after the pattern, to be produced, has been carefully colored upon the plaid paper, by examining the paper, the workman or printer must be governed or directed in printing or coloring the yarn.

Small blocks or types, the breadth of the band of threads, and the length required for one, two, or more loops of the carpet, when woven, must be provided, according as the pattern paper directs, and screwed up into a small hand block;—thus, if the pattern directs one loop should be printed or stamped black, one type or block must be placed to print or stamp it, and then the number of blanks and printing types which follow, are added, until one hand block of a convenient length, is formed,—the whole being screwed together; or a single block may be used, taking one or more colors from a party-colored sieve, at the same dip, and applying it direct to the yarns.

When the entire bands or lengths of the warp threads have been printed or stamped, as they are passed over the table, they must be each distinguished by a number or letter.—After the length of threads, lying at one time upon the surface of the table, has been printed or stamped, a nipper or clasp is to be closed on to the threads, at the end opposite to *g*, fig. 4, in order to remove it and allow another length of the yarns to be drawn over the printing table,

The printed or stamped threads are hung up, to partially dry, (as shewn in fig. 4,) and are afterwards completely dried, by passing over the heated cylinder *l*; thence, they proceed over guide rails *m*, and being there separated by upright wires, are wound into hanks upon the reels *n*, *n*.

The hanks must also be carefully numbered, when taken off the reels, each hank forming only one warp thread, the entire length of the piece,—the same numbers being of course employed, as previously marked in the printing; they may then be steamed, washed and dried, or otherwise treated, as in woollen printing.

When these hanks are required to form the warp threads of carpets or rugs, they are to be wound again upon bobbins, which are numbered the same as the hanks. The bobbins should then be taken in their numbered order, and in sufficient quantities to make a full warp.

These bobbins *a*, *a*, are now to be placed upon spindles and boards *b*, as just described, shewn in figs. 1, 2, and 5, beginning with thread No. 1, and passing it through the first space of the sley or reed *e*, and so on, for the entire width; then the full warp is to be beamed on the roller *f*, for the loom, direct from the spindles,—which being done, the beam of warp may be removed to a common plain cloth loom, to be woven, but producing, instead of plain cloth, the printed or stamped pattern, on the surface of the carpet or hearth-rug.

Figs. 6 and 7, represent a plan and side view of a slight temporary loom, in which the third part of these improvements is effected.

A similar creel of bobbins *a*, *a*, *a*, as those before described, are placed upon the boards and spindles *b*, *b*, and contain the warp-threads, either single, double, or treble, according to the quality of the intended fabric; but, instead of beaming them at once for the loom, they are passed over guide or friction-rollers *c*, *c*, through the healds *d*, *d*, and reed or sley *e*, *e*, and at every inch or more of space, a weft-thread is thrown, in order to convert the warp-threads or yarns into a preparatory gauze-work, without weaving any positive or permanent fabric or cloth (see fig. 6); thus a

partial weaving is effected, with temporary cross-threads, by means of the harness and sley; the gauze is then drawn off on to the beam *f*, by means of the toothed gearing *g*, and winch *h*, and is then ready for printing.

The fourth part of these improvements having been herein before fully explained, will requir eno further illustration. —[*Inrolled in the Petty Bag Office, July*, 1841.]

Specification drawn by Messrs. Newton and Son.

To JOSEPH COOKE GRANT, *of Stamford, ironmonger and agricultural implement-maker, for improvements in horse-rakes and hoes.*—[Sealed 8th September, 1841.]

THE first part of this invention consists in an improvement in horse-rakes, by which means the hay, stubble, or other matter to be raked up, is more readily discharged from their teeth.

In Plate VIII., fig. 1, is a side view of a horse-rake, constructed according to this improvement. *a*, are the tines or teeth of the rake, made of the form shewn in the drawing, and are each secured to the end of an arm *b*, suspended by chains *e*, from the bar *f*. The other ends of the arms are inserted in sockets *c*, upon the axis *d*; a plan of one of these sockets is shewn in fig. 2. The bar *f*, is attached to the ends of a pair of levers *g*, mounted on an axis *h*, and connected by a link *i*, with a pair of curved levers *j*. These levers turn on an axis *k*, and are worked by a handle *l*, that connects their outer ends together. *m*, is a support, upon which the bar *f*, rests, when the parts are in the position shewn in the drawing; and *n*, is a catch, for holding the bar *f*, when it is raised for the purpose of lifting the tines *a*, from the ground.

To raise the tines *a*, in order to discharge the hay, the handle *l*, is pulled downwards; this movement, through the link *i*, causes a depression of the end *o*, of the lever *g*, and a consequent elevation of the bar *f*, the outer ends of the arms *b*, and the tines *a*, attached thereto.

The second part of this invention relates to improvements in horse-hoes, and consists in the application of the combined action of the parts marked *g*, *i*, *j*, to lift the bar *f*, connected to arms *b*; but, in this instance, instead of the tines *a*, suitable stems are fixed to these bars, provided with hoes or cutters.

The patentee claims, First.—The mode of connecting the arms *b*, of horse-rakes, with their axis *d*, by the cast-iron sockets *h*.

Secondly.—Combining the arms *b*, of horse-rakes, with curved tines or teeth *a*, as described.

Thirdly.—The application of the combined action of two levers *g*, *j*, working on different axes, in connection with the bar *f*, to facilitate the lifting of the tines or teeth of horse-rakes.

Fourthly.—The application of a lever *j*, to horse-rakes, when so connected with a bar *f*, (for raising the tines or teeth,) as to require the lever *j*, to be depressed, in order to lift the tines or teeth, as described.

Fifthly.—The mode of applying the compound lever action *g*, *i*, *j*, to the bar *f*, of a horse-hoe, having independent arms *b*, as described.—[*Inrolled in the Inrolment Office, March*, 1842.]

To JOSEPH HALEY, *of Manchester, engineer, for an improved lifting jack, for raising or removing heavy bodies; which is also applicable to the packing or compressing of goods or other substances.*—[Sealed 31st December, 1840.]

THIS invention consists in a peculiar construction of jack, which possesses greater strength than those at present in use.

In Plate VIII., fig. 1, is a front view of the improved jack, and fig. 2, a transverse section of the upper part of the same. *a*, is the stock, formed of hard wood, and protected at the top by a turned iron cap *b*, and at the bottom

by a flanged sole-plate *c*, in a recess, in the front of which a bevilled steel plate *d*, is fastened. The use of this plate is to prevent the jack from slipping, when working on a hard surface, in an inclined position. The lifting-screw *e*, passes through a worm-wheel *f*, which rests upon a strong wrought-iron plate *g*, and receives motion from a horizontal worm-shaft *h*, turned by a handle at its end. The interior of the wheel *f*, is formed into a female screw, corresponding with the thread of the lifting-screw; and hence, by the rotation of the wheel, the latter will be raised or lowered.

The body to be raised, is supported by the head of the screw *e*, or by the claw *i*, forged on its lower end. The shoulders of this claw, working against the facing *j*, of the jack, keep the lifting-screw in a vertical position.

A modification of this jack is shewn in the section fig. 3, in which the lifting-screw *e*, passes through a bevil toothed wheel *k*, connected to the iron plate *g*, and motion is communicated to that wheel by a pinion *l*.

The patentee claims, Firstly.—The general construction and arrangement of parts herein described.

Secondly.—Forging and constructing the claw *i*, as a solid part of the main screw *e*, and guiding the same on the exterior of the jack, by which means the main screw is kept in an accurate perpendicular position, when in action.

Thirdly.—The placing of an internal screw-wheel inside the stock, by means of which it is kept clean, and protected from injury.—[*Inrolled in the Inrolment Office, June*, 1841.]

To Gottlieb Boccius, *of New Road, Shepherd's Bush, in the county of Middlesex, Gent., for certain improvements in gas, and on the methods in use, or burners for the combustion of gas.**—[Sealed 27th January, 1842.]

These improvements, in the combustion of gas, consist in placing two or more concentric chimnies or cylinders above the surface or jet-holes of the burners, in addition to, and

* On the day of Inrolling this Specification, the Patentee entered a Disclaimer to part of the above Title, by which alteration it stands thus,—"Certain Improvements for the Combustion of Gas."

within the ordinary glass chimney, in the manner shewn in the sections, figs. 1 and 2, Plate VIII.

These figures exhibit the mode of applying this invention to gas-burners, of the kind called one-ring burners, and are marked with the same letters of reference. *a*, is the burner, supplied with gas by the pipe *g*;—*b*, the ordinary chimney, resting upon the arms *c*, *c*; and *d*, *d*, are supports or standards, carrying the additional chimnies *e*, *f*, connected together by rivets. The inner chimney *e*, corresponds, in diameter, with the circle formed by the jet-holes, and the outer additional chimney *f*, with the circle formed by the periphery of the burner. The space between the chimney *f*, and the ordinary chimney *b*, is the same as between *e*, and *f*; and the latter chimnies are situated at a height above the flame, equal to the diameter of the chimney *e*; this height may, however, be increased, if desired, when one-ring burners are used.

When this invention is used with two or three-ring burners, the tubular rings that compose them are placed one above another, and connected together by short pipes, which supply them with gas. By this arrangement, the patentee states, that a flame will be obtained of a greater brilliancy, and more uniform height than usual.

Fig. 3, is an elevation, and fig. 4, a plan of a three-ring burner, constructed in the way just mentioned. *a*, *a*, *a*, are the rings of the burner; *g*, is the gas supply-pipe, from the upper part of which, three pipes *h*, *h*, *h*, extend to the outer ring of the burner; from this ring, the gas is conveyed to the second ring, by the pipes *i*, *i*, *i*, and passes from thence to the inner ring, through the pipes *j*, *j*, *j*.

In applying these additional chimnies to burners of this construction, the inner chimney *e*, is made of the same diameter as the circle of jet-holes on the outer ring of the burner. The additional chimnies may be used with burners of any other shape, with equal advantage.

The patentee claims the particular combination, position, and arrangement, of the several parts or apparatus, hereinbefore described, for the combustion of gas.—[*Inrolled in the Petty Bag Office, July*, 1842.]

To Thomas Robinson, *of Wilmington-square, in the county of Middlesex, Gent., for improvements in drying wool, cotton, and other fibrous materials, in the manufactured and unmanufactured state.* — [Sealed 27th April, 1841.]

This invention consists in certain arrangements of machinery, for drying fibrous materials, by exposing them to the action of currents of air.

One arrangement of machinery, for this purpose, is exhibited in figs. 1 and 2, Plate VII.,—fig. 1, being a longitudinal, and fig. 2, a transverse section. *a*, is a case or chamber, through which a shaft *b*, passes, carrying two revolving compartments *c*, *c*, for containing the goods to be dried; these compartments are closed at the sides, but their ends are open, and across them the bars *d*, are fastened, to prevent the articles from being forced out of the compartments, by the rapidity of their revolution.

In either side of the case *a*, near the shaft *b*, are openings *e*, *e*, for the admission of air, and in the ends of the case are other openings *f*, *f*, through which the air passes out; *g*, *g*, are apertures, in the bottom of the case, for the passage of the water or other fluid contained in the articles to be dried.

Motion is communicated to the shaft *b*, by a band from a steam-engine, or other prime mover, passing round the pulley *h*, on the end of the shaft; or by power derived from manual labour, applied to the handle *i*, and transmitted, by the wheel *j*, to the pinion *k*, on the other end of the shaft *b*.

The operation of this machinery is as follows: —When the fibrous materials are admitted through the doors *k*, and placed in the compartments *c*, the shaft *b*, is caused to revolve, and the air, entering at the openings *e*, *e*, passes through the compartments, and among the materials contained in them; but being forcibly ejected, by the rapid revolution, it passes out of the case at the openings *f*, *f*. Whilst the air is thus rushing through the revolving com-

partments *c*, the articles, contained in them, are constantly changing their position, and, by the force with which they are pressed against the outer bars of the compartments, the water or other liquid contained in them is expressed, and the remaining moisture is quickly evaporated.

Fig. 3, is a longitudinal section of another machine, for drying manufactured or unmanufactured fibrous materials. In this machine, the case *a*, and openings *f, f*, and *g, g*, are the same as before; but, instead of two revolving compartments *c, c*, for receiving the articles to be dried, a rotary wheel *l*, is employed, divided into four compartments, by bars *m*, each compartment being provided with a door *n*, for the admission of the goods. The air enters the case by the holes *o, o*, near the shaft *b*, and, rushing through the compartments, passes out at the openings *f, f*, as before.

The patentee claims the mode of constructing machines, for drying cotton, wool, and other fibrous materials, in a manufactured or unmanufactured state, as described.—[*Inrolled in the Inrolment Office, October*, 1841.]

To Joseph Ratcliff, *of Birmingham, in the county of Warwick, manufacturer, for certain improvements in the construction and manufacture of hinges, for hanging and closing doors,—being a communication.*—[Sealed 4th August, 1841.]

In Plate VII., fig. 1, is a longitudinal section, and fig. 2, a plan of the improved hinge. *a*, is an upright axis, the upper end of which turns in a brass bearing *b*, and the lower end works in the cylindrical cavity *c*, in the bottom of the cast-iron box or case *d*. To the lower part of the axis *a*, a segmental plane *f*, is attached, its upper surface being inclined to the axis, so as to make therewith, an angle of about seventy degrees; and on the square head of the axis is fitted the lever *e*, which is screwed to the bottom of the door.

Upon the plane *f*, two rollers *g, h*, rest, carried by a

broad lever *i*, which turns on an axis *j*, supported by the brackets *k*, *k*; and from the hind end of the lever *i*, two arms *l*, *l*, rise, carrying the swivel-nut *m*.—*n*, is another nut, screwed on the pin *o*, between which, and the swivel-nut *m*, the helical springs *p*, and *q*, are placed. A number of holes are made in the periphery of the nut *n*, for the reception of a lever, to turn it, when it is required to approach or recede, from the nut *m*. The action of this hinge is as follows:—

When the door is opened, the lever *e*, turning the axis *a*, partly round, will bring a more elevated part of the plane *f*, under one of the rollers *g*, or *h*, and so raise the end of the lever *i*; the arms *l*, *l*, and swivel-nut *m*, will be thus caused to approach the nut *n*, and compress the springs *p*, *q*, which, when the door is released, will expand and close it.

The patentee claims, Firstly.—The general arrangement of the parts of a door-hinge, as herein described, and illustrated by the accompanying drawings.

Secondly.—The use of the swivel-nut, for receiving and transmitting the pressure of the spring to the lever.—[*Inrolled in the Inrolment Office, February*, 1842.]

To HENRY BARRON RODWAY, *of Birmingham, wine merchant, for improvements in the manufacture of horse-shoes.*—[Sealed 7th March, 1842.]

THIS invention has for its object, the formation of a shoe, which will secure a firm foot-hold to horses, on all kinds of pavements, and be, at the same time, lighter, and remain longer on the foot than shoes now in use. It consists in forming the shoe of bar-iron, not less than three-quarters of an inch wide, in which a groove, at least three-eighths of an inch in width, has been formed, by rolling.

In Plate VIII., fig. 1, is a view of the under side, and fig. 2, a section of the improved shoe. *a*, is the groove, in which holes are made for the nails that secure the shoe on the horse's foot; *b*, and *c*, are the outer and inner edges

of the shoe, the former being higher, and twice as broad as the latter. It will be seen, that as the heads of the nails do not come in contact with the ground, being protected by the raised parts *b*, and *c*, there is less chance of the horse casting this shoe than an ordinary one.

The patentee claims the mode of manufacturing horse-shoes, by employing bar-iron, rolled with a groove therein, at least three-eighths of an inch wide and in a bar, at least three-quarters of an inch wide, as above described.—[*Inrolled in the Inrolment Office, September*, 1842.]

To Moses Poole, *of Lincoln's-inn, in the county of Middlesex, Gent., for improvements in the manufacture of caustic soda and carbonate of soda.*—[Sealed 9th December, 1839.]

These improvements consist in manufacturing caustic soda and carbonate of soda, from common salt.

In the first place, common salt is decomposed with sulphate of ammonia, by which means, sulphate of soda and hydrochlorate of ammonia is obtained. The former is then changed into sulphuret of sodium, by being heated with coal, charcoal, or any other sort of carbon; and the latter is reserved, for the purpose hereafter mentioned. The sulphuret of sodium, thus produced, is dissolved in water, and filtered; it is then decomposed, by mixing with it protoxide of copper, in a pulverized state. By the decomposition of the sulphuret of sodium, sulphuret of copper is formed, which is separated from the liquid by filtration. This liquid (which contains caustic soda) is evaporated to dryness, if solid caustic soda is wanted; or is saturated with carbonic acid, if carbonate of soda is required.

The sulphuret of copper is now converted into deutoxide of copper, by calcining it in an iron muffle, heated to a "feeble degree of glowing." A slow current of atmospheric air, being permitted to pass through the muffle, carries off the sulphurous acid gas, produced by the calci-

nation, into an apparatus used for making sulphate of ammonia. The sulphuret of copper is kept well stirred, until (the smell of sulphurous acid ceasing) it is found to have changed into deutoxide of copper; it is then removed, and a fresh quantity of sulphuret of copper is placed in the muffle. The deutoxide of copper being now heated, with a suitable quantity of coal, is converted into protoxide of copper, which is again used, in the manner before described.

The apparatus employed, for making sulphate of ammonia, consists of a leaden chamber, filled with fir-wood chips, into which the air, containing the sulphurous acid gas, is admitted, after having been cooled, by passing through a pipe, surrounded with cold water. A quantity of caustic ammonia (produced by decomposing the hydrochlorate of ammonia, before mentioned, with caustic lime,) being now admitted at the upper part of the chamber, passes through the interstices of the chips, and, absorbing the sulphurous acid, is changed into sulphate of ammonia. The air now passes into a second chamber, filled with chips, over which a weak solution of sulphuric acid flows, and absorbing the ammonia, carried off by the air from the first chamber, converts it into sulphate of ammonia.

The solution of sulphate of ammonia, produced by these processes, is converted into sulphate of ammonia, by exposing it to atmospheric air. This is effected by employing a frame, filled with fir-wood chips, over which the solution is permitted to flow, (being received in a chest beneath, and then pumped up again,) until it is converted into sulphate of ammonia. It is now ready to be used for decomposing common salt, for the purpose mentioned in the first part of this invention.

The patentee claims, as his improvements in the manufacture of caustic soda, and carbonate of soda, the decomposition of sulphuret of sodium, by the protoxide of copper; and, in combination with this process, the production of sulphate of ammonia; and also, the conversion of a solution of sulphate of ammonia into the sulphate, in the manner herein described.—[*Inrolled in the Inrolment Office, June,* 1840.]

To André Dronot de Charlieu, *of Coleman-street-buildings, in the city of London, Gent., for improvements in obtaining matters to be consumed in obtaining light, and in the construction of burners for burning the the same,—being a communication.*—[Sealed 27th April, 1841.]

The first part of these improvements consists in preparing a liquid, to be consumed for the purpose of producing light.

The liquid consists of a mixture of volatile or essential oils and spirits, in proportions suitable to the purposes for which the liquid is required, the essential oils marking 75°. In making the liquid, the areometer of Gay Lussac is employed, to test the strength of the spirits.

The patentee illustrates this improvement, by describing the proportions of the materials used in making a liquid for three different purposes, viz., first, a liquid that produces a superior flame, with but little smoke; secondly, a liquid that produces a strong flame, with more smoke; and thirdly, an inferior liquid, that produces much more smoke than either of the former.

The first liquid is composed of twenty-three parts essential oil, and seventy-seven parts spirit, of the strength of 95°. The second liquid is composed of thirty-three parts essential oil, and sixty-seven parts spirit, of the strength of 97°. The third liquid consists of equal parts of essential oils and spirits, the latter being of the strength of 99°. The oils and spirits, after being mixed together, are distilled, and the liquid is then ready for use.

The second part of the improvements consists in an alteration in the construction of ordinary gas-burners, so as to render them suitable for consuming the liquid above mentioned.

To the under side of the centre of the burner, or to the under side of each of its holes, an upright stem is fixed, and is thus kept heated by the flame, so that the liquid (which is conducted up to the burner by cotton yarn) is volatilized as it ascends, and the vapour, escaping through the holes in the burner, is consumed.

A hoop, covered with cotton, and attached to a stem or handle, is used for lighting the burner, in the following manner:—The hoop, after being immersed in some of the liquid, and ignited, is passed down over the burner, and held below the upper part of the same, until a vapour is produced in it; this vapour escapes though the holes in the burner, and becomes ignited. The hoop may now be removed, as the heat of the flame will produce the requisite quantity of vapour.

The patentee claims, firstly, the mode of preparing materials, for the purpose of producing light, by combining essential oils and spirits, and obtaining a liquid therefrom by distillation; and secondly, the mode of constructing burners, for consuming the liquid above described.—[*Inrolled in the Inrolment Office, October*, 1841.]

To MATTHEW UZIELLI, *of King William-street, in the city of London, merchant, for an invention of improvements in impregnating and preserving wood and timber, for various useful purposes,—being a communication.*—[Sealed 11th January, 1841.]

THIS invention consists, firstly, in an improved mode of impregnating wood, and timber in general, with certain chemical materials; and secondly, the novel use of certain materials for impregnating wood, for the purpose of effecting certain peculiar objects.

The first head of the invention consists in extracting the sap and other juices from green wood, and then introducing into the vasculatory tubes thereof, certain matters, either mineral, vegetable, or animal, in order to preserve the wood, and render it more flexible and elastic; also for increasing its hardness, and diminishing its combustibility. The same also prevents the wood from contracting and warping, when put into use, and facilitates its drying; and lastly, imparts to the wood varied and permanent colors, and fragrant odors.

In order to produce this result, the log of wood or timber

is placed in a trough, in an upright position, and a flexible receptacle, as a bag of water-proof cloth, open at both ends, is adapted to the upper end thereof. In order to prevent any leakage, a groove is cut round the upper end of the log of wood, within three inches of the top, and the cloth bag affixed tightly thereto, by means of a strap or cord, which, by being passed round the groove, effectually closes it, and prevents any of the liquid from escaping.

Any of the hereinafter-mentioned chemical materials, which may be chosen by the operator, to produce any of the objects mentioned above, is poured into the bag, to the depth of a few inches above the top of the log, and at the same time that the liquor penetrates the wood at the upper end, the sap runs out in a proportionate degree at the lower end, and the operation will be completed, when the liquid, which escapes or runs out from the lower end of the log, is nearly identical, in quality, with that which is poured into the bag or reservoir above.

The displacement of the sap is effected without any further pressure than that given by the weight of the liquid, kept a few inches deep in the bag above; it is, therefore, necessary that the bag should be constantly supplied with liquor. By this process, about forty per cent. of the sap may be collected in a state of purity, the other portion running off amalgamated, in different degrees, with the material introduced.

Under the second head of this invention, the mineral, animal, or vegetable substances, required to effect the abovementioned objects, are the following:—

Firstly.—For preserving and hardening the wood, the rough pyrolignite of iron should be used in solution, marking from 3 to 6 degrees. If the wood only requires preserving, the chloride of sodium, of from 5 to 10 degrees, should be employed.

Secondly.—For increasing the flexibility and elasticity of the wood, and preventing it from warping; and also, as a preservative against combustibility, chlorides of calcium or magnesium should be used in solution, marking from

5 to 12 degrees. The mother waters, of salt marshes, will also effect these results, the cost of which is very trifling.

Thirdly.—The dessication or drying of the wood is hastened, by the employment of sulphate of soda in solution, marking from 3 to 6 degrees.

Fourthly.—Different colors are obtained, by the employment of mineral or vegetable coloring matters, or by means of some animal substances.

Among minerals, blue is obtained, by the successive introduction of pyrolignite of iron, and prussiate of potash.—Yellow, by the acetate of lead, and the chromate of potash.—Green, by the successive formation, in the interior of the wood, of blue and yellow.—Other colors are obtained, by the employment of sulphate of copper, and the prussiate of potash; the sulphate of iron, and the chromate of potash; the deutochloride of mercury, and the iodide of potassium.

Some colors are also produced from vegetable substances, but they have not the solidity and permanency of the mineral colors. They are produced by the infusion or decoction of known coloring matters, such as log-wood, French berries, turmeric, and other dyeing substances.

Among animal matters, the ammoniacal solutions of carmine and some other substances, may be employed.

Fifthly.—In order to impart a fragrant smell to different woods, alcoholic solutions of essential oils, and other odoriferous substances, may be employed.

The patentee claims, firstly, the improved method, above described, of impregnating wood or timber with chemical materials, for the purpose of preserving, improving, and beautifying its quality; and secondly, the application of the peculiar materials above mentioned, for the purposes above described.—[*Inrolled in the Rolls Chapel Office, July,* 1841.]

Specification drawn by Messrs. Newton and Son.

To Andrew Kurtz, *of Liverpool, in the county of Lancaster, manufacturing chemist, for certain improvements in the manufacture of artificial fuel.*—[Sealed 27th January, 1842.]

These improvements, in the manufacture of artificial fuel, consist, principally, in equalizing the strength or combustible quality of the various species of coal, by bringing the several varieties to one uniform standard, and thereby imparting, by artificial means, the same powers of combustion, in evaporative processes, to the inferior sorts of coal, which are possessed by the best known quality, in its crude or natural state.

This is effected by mixing with inferior coals, such proportionate quantities of coke made from coals, resin, and napthaline, with pitch made from gas-tar, or other bituminous substance, as will equalize or counterbalance the combustible strength or evaporative power of such inferior coal, with that of the best coal known or found in England and Wales.

The proportionate quantities of superior combustible matters to be added to the inferior coals, in order to bring them up to the same standard of evaporative power as the best English or Welsh coal, must of course depend upon the inferiority of the coal to be improved. As the British Government standard, for contracts for artificial fuel, is, that one pound of fuel shall evaporate eight pounds of water, this is taken as a standard; and the under-mentioned experiments will shew the manner and proportions in which the addition of the combustible matters must be made to inferior coal.

The evaporative power of coals will be found nearly as follows:—One pound of anthracite coal will evaporate eight pounds of water; one pound of best Welsh coals, seven pounds to eight pounds; one pound of Liverpool coals, called Smith's coals, seven pounds; one pound of ordinary Liverpool coals, four to six pounds. Newcastle coals are similar in effect to Liverpool coals; thus it will be per-

ceived, that where the best Welsh coal wants one part of superior combustible matter, ordinary or inferior coals will require four or more parts; the proportions must, therefore, be varied according to the ascertained quality of the coal, when in a natural state.

Secondly.—These improvements consist in the application and use of certain machinery or apparatus, for the purpose of preparing and mixing the component parts of such artificial fuel, and forming or moulding the same into portable and convenient shapes or bricks, for use, as follows:—

The natural coal is first to be ground small, between an ordinary pair of horizontal grinding-stones, or in a grinding-mill, and is afterwards to be submitted to a drying-kiln or apparatus, for the purpose of expelling all moisture from the coal. This drying apparatus is to be constructed with three chambers or compartments, say twelve feet long by nine feet wide, and by six feet deep altogether. The flooring of these chambers should be of plate-iron, and somewhat dished or sunk in the middle, and also provided with a small aperture or opening, with a sliding door or cover to each. Between each compartment, and around these chambers, there are flues, heated by the flame and air proceeding from the furnace or fire-place, situate at one end of the apparatus, and each flue is to be provided with a damper, to regulate the heat, as required.

The upper chamber or compartment is open at top, and may be called the reservoir, and in this the ground coal is to be placed, after being taken from the grinding apparatus and heated or dried, so that the principal part of the moisture is evaporated; the sliding door is then to be removed from the opening in the bottom of this reservoir, and the coal raked or pushed down into the middle or drying chamber. In this chamber the pulverized coal is also to be further dried and heated, to about three hundred degrees Fahreneit, so that no moisture whatever remains; the sliding-door is next to be removed from the aperture in the bottom of this chamber also, and the coal passed into the bottom or mixing chamber. Whilst the pulverized and dried coal is lying in

the lower chamber, pitch or other auxiliary combustible matter is to be supplied, through a trough or other convenient means, and in such proportions dependent upon the quality of the coal under operation; and after being sufficiently mixed together, by raking or otherwise, it may be carried away, in boxes or baskets, to the next process.

The composition or artificial fuel now being in a plastic state, is to be put into a machine, very similar, in form and in the mode of its operation, to an ordinary clay or pug-mill, as used by brick-makers. The chamber or vat of this apparatus is six feet in diameter at top, eight or nine feet deep, and tapering downwards; it is made of cast-iron, and surrounded with a jacket or casing, to act as a steam-chamber, in order to keep the composition in a continuous heated state, and thus capable of being more efficiently worked. For this purpose, a steam-pipe is supplied to the lower part of the casing of the pug-mill, conveying the waste steam from the steam-engine employed to work the whole system of apparatus, and the steam is passed off at the upper part of the vessel, the condensed water escaping below.

The interior of this pug-mill is somewhat peculiar in its construction, and consists of a central upright shaft, which is driven by a steam-engine or other moving power, connected to gearing below. Upon this shaft, of about six inches in diameter at the lower end, and tapering upwards, to about four inches, are placed several (say six) pairs of arms or agitators, about nine inches wide, and reaching to within an inch of the inside of the mill, at the top, and about six inches at the bottom, each alternate pair being set or fixed at right angles with the adjoining pair, and each arm placed at an angle of about twenty degrees from the plane of the horizon; so that when the shaft revolves, these arms or agitators will act as one continuous screw, and keep forcing or conducting the composition in the mill towards the bottom, simultaneously with the mixing process. A separate or independent arm is also fixed at the lower end of the shaft, touching the bottom of the pug-mill. This arm is formed helically, and its outer end forces

the composition or fuel, in a continuous stream or course, out of an aperture or mouth-piece, formed at the bottom of the mill. This aperture or trough may be shaped in any way, being open at the top, and having the sides and bottom square, so as to form the plastic composition, as it is being forced from the mill.

Masses of this compound are now to be taken from the opening, at the bottom of the pug-mill, and, whilst in a heated state, to be thrown or cast into square boxes or frames, the depth of an ordinary brick; when the plastic material will flatten, as it cools, and spread itself evenly, until it is confined by the sides of the frame; these frames may be large enough to contain a sufficient quantity to form one hundred bricks or cakes of fuel. When the composition is sufficiently cooled, but not allowed to harden, it may be cut into forms or bricks, by means of a cylinder, having a series of rotary cutters placed thereon, at given distances apart, and projecting from the cylinder, so as to pass through the entire depth of the cake of fuel in the frames.

The frames must be well moistened, with a strong solution of lime, and the cutters and cylinders must also be well supplied with a similar solution, from a saturated brush above, so that all sides of the bricks or cakes of fuel shall be coated over with lime; and this will prevent their adhering to each other, when packed closely together for use.

The patentee claims, the manufacture of artificial fuel, firstly, by bringing all natural coals to one uniform standard of combustible power or effect, by artificial means; that is, by adding such proportions of coke, resin, and napthaline, with pitch, to inferior coals, as will equalize or counterbalance the combustible strength of the best coals known or found in England and Wales; and secondly, the application and employment of the machinery or apparatus, herein described, for the purpose of preparing, mixing, and pressing or shaping, such artificial fuel into convenient portions, shapes, or bricks, for use.—[*Inrolled in the Rolls Chapel Office, July,* 1842.]

Specification drawn by Messrs. Newton and Son.

To WILLIAM EDWARD NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draftsman, for an invention communicated to him by* HENRY FREDERICK SCHMOLL, *of Paris, of improvements in obtaining a concentrated extract of hops, which the inventor denominates "humuline."*—Sealed 15th February, 1841.]

THIS invention of improvements in obtaining a concentrated extract of hops, consists in submitting the plant called the hop, *humulus supulus*, to a certain process, by means of which, the extract or essence of the plant is obtained in a better and more perfect manner, than when boiled up with wort in the manufacture of beer, as is at present the case.

By means of the process hereafter described, two separate and distinct products are obtained, one being the essential oil of the resin or spirituous tincture; the other, the "extract," which is a gummy or aqueous decoction of the plant. These products are obtained in the following manner:—

The hops are dried in a stove or oven, heated to about 86° of Fahrenheit's thermometer, and when brittle or friable, they must be rubbed or passed through a sieve, the meshes of which are not more than the tenth of an inch wide. The coarse powder is then placed in a closed cylinder, called, by the inventor, the displacing cylinder. As much alcohol is then poured into the cylinder, as the powder will absorb, and a further quantity supplied until a layer of about an inch and a half deep covers the powder. The contents of the cylinder are then submitted to a considerable pressure, and allowed to remain in this state, for about twenty-four hours, after which time, the alcoholic tincture may be drawn off into a tub or other vessel.

The alcohol is washed out of the contents of the cylinder, by adding water thereto, until the liquor, which runs out of the cock, becomes clear and colorless. This same water is again added to the contents of the cylinder, and the hops are macerated in it, for the space of forty-eight hours. After this maceration, the liquor is drawn off, and the hops

are washed with fresh supplies of water, in order that no extract may be allowed to remain.

By this means, the following products are obtained, viz.: the alcoholic tincture, holding in solution the essential oil, and also the ordinary decoction, dissolved or held in solution by water. These three distinct products may be united into one homogenous mass, in the following manner:—

The alcoholic tincture and essential oil are placed in a suitable vessel, and subject to the action of a water bath, which must be furnished with a still head, and submitted to the process of distillation, in order to drive off the alcohol, which by this means is obtained perfectly colorless and limpid, and as such is the case, it proves that all the essential oil remains in the preparation or residuum, which is a brownish yellow resin, covered with a layer of yellowish liquor, some inches in depth, and composed of a watery extract. The aqueous decoction, to which is added the above watery extract, which floats on the surface of the resin, is then evaporated by an open fire, until it comes to the consistence of a syrup; it is then removed to the water bath and evaporated, until it becomes a nearly solid extract. This extract, which is about the color of chocolate, and of the agreeable bitter taste, the characteristic of hops, is mixed with the resin, which has been previously softened or melted, by means of the water bath.

By this method of preparing the hop, about 32 to 34 per cent. of extract is obtained from good hops; and all that the plant contains of those substances, necessary for the manufacture of beer, is drained out or otherwise obtained.

The humuline, when prepared in this manner, assumes the form of a nearly solid extract, of a blackish brown color, with a pungent smell, similar to the hop, the taste being, at first, bitter, and afterwards of an acrid taste.

In order to preserve the humuline, it must be softened or melted, by the application of heat, and poured into tin or earthen vessels, previously well dried. It must then be left to cool gradually, and a small quantity of alcohol poured on to the surface, just sufficient to cover it.

Upon allowing the alcohol to evaporate, the surface of

the humuline, in the vessel, will be covered with a thin coating or film, which, as long as it remains unbroken, will effectually prevent the humuline from becoming mouldy or otherwise injured, by exposure to the air.

When the humuline is required for the manufacture of beer, a sufficient quantity of the gummy extract is placed in an earthen vessel, and to every two pounds of the extract, about one pint and a half of hot water is added; the earthen vessel is then placed in a water-bath, in order to dissolve the gummy extract. The resinous extract is dissolved in a small quantity of alcohol, and when the two solutions are once quite limpid, they are mixed, and added to the wort, at any moment required.

The humuline is added to the beer, in about the following proportions:—Two pounds weight of humuline in place of six pounds weight of common hops.

If the two extracts are not previously mixed, the brewer may, at his discretion, mix them in any proportions that may be required.

A valuable extract is also obtained from hops, by placing them either in a pulverized or whole state, in a closed cylinder, and submitting them to the action of steam, either under considerable pressure, or at the mean pressure of the atmosphere, and, by the partial condensation of the steam which will take place, a liquid extract of hops is obtained; the watery particles of which may, if required, be evaporated to the same consistence as the humuline, and preserved in a similar manner.

The principle advantages resulting from the employment of humuline, are the following:—First, economy,—for by employing humuline, the brewer obtains from 15 to 20 per cent. more of the hop than when boiling the plant in the wort.

Another advantage, is the superior quality of beer which is produced. The next advantage, is the practicability of the brewer availing himself of a good crop of hops, as he may buy a large quantity, when they are good, and the market is overstocked, and, by reducing them to humuline, he is enabled to keep them any length of time, without

being liable to spoil, as is the case when the plant is kept longer than a year.

A further advantage consists in the small space which the essence or useful qualities of this plant occupies, thus rendering it eligible for sea voyages, in which it would be extremely useful for making beer, and as a remedy against scurvy.

The patentee claims the methods above described, of making or producing a concentrated extract of hops.—[*Inrolled in the Petty Bag Office, August,* 1841.]

Specification drawn by Messrs. Newton and Son.

To Robert Warington, *of South Lambeth, in the county of Surrey, Gent., for improvements in the operation of tanning.*—[Sealed 16th March, 1841.]

The first improvement consists in preparing hides or skins for unhairing, by soaking them in a solution of the carbonate of potash or soda, composed of from one to two pounds of the carbonate to ten gallons of water.

The second improvement consists also in preparing hides or skins for unhairing, and at the same time swelling them; or in swelling them only, by immersing them in solutions of the three following kinds of articles, viz.: first, baryta, potash, and soda; second, all the acids, except sulphuric acid; third, vine cuttings, sorrel, culinary rhubarb, and such like vegetable matters.

The solutions the patentee prefers to use, are, of the first kind,—a solution of soda, composed of from half a pound to a pound of dry carbonate of soda, dissolved in ten gallons of water, which has been previously rendered caustic, by the addition of half its weight of fresh burnt lime; of the second kind,—a solution of muriatic acid, composed of from half a pound to two pounds of the acid, of specific gravity 1.17, to ten gallons of water; and of the third kind,—a mixture of from one to ten pounds of bruised culinary rhubarb, and one gallon of water.

The third improvement relates to graining hides and skins, and consists in using, for that purpose, a solution, composed of from half a pound to four pounds of carbonate of ammonia, and ten gallons of water.

The fourth improvement is for the purpose of preventing oxidation, and consists in mixing, with the tanning agent, small quantities of those vegetable matters and chemical agents, that are capable of retarding oxidation, such as bruised culinary rhubarb, bruised potatoes, &c., and gum, starch, &c.

The fifth improvement consists in preventing the putrifaction of hides, skins, or other animal substances, by immersing them in a solution of bichromate of potash, or of sulphuric acid; the former consisting of from one-eighth of a pound to half a pound of the bichromate to one hundred gallons of water, and the latter of from a quarter of a pound to a pound of sulphuric acid to ten gallons of water.

The patentee claims, Firstly.—The use of carbonates of soda or potash, for soaking the hides or skins, so as to render the hair capable of being easily removed.

Secondly.—The employment of baryta, potash, soda, all the acids, except sulphuric; and also vegetable matters, such as culinary rhubarb, sorrel, apple marc, &c.; for the purpose of facilitating the removal of the hair, and at the same time swelling the hide or skin, or for swelling them only.

Thirdly.—The use of the carbonates of ammonia, as a grainer, for the purpose of graining hides or skins.

Fourthly.—The employment of vegetable matters and chemical agents, capable of retarding oxidation, such matters or agents being used with the tanning agent employed.

Fifthly.—The use of bichromate of potash, in solution, or diluted sulphuric acid, for preserving skins or other animal substances.—[*Inrolled in the Inrolment Office, September,* 1841.]

To William Edward Newton, *of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in the manufacture of fuel,—being a communication.*—[Sealed 7th July, 1841.]

This new combustible, called by the inventor, "carboleine," is chiefly composed of two combustibles, namely, pulverized coal and vegetable or animal oil.

There are various modes of manufacturing this carboleine, according to the purposes for which it is required, either for steam-engines, smithies, foundries, glass-houses, or for heating common stoves, chimnies, and kitchen ranges, in dwelling-houses.

If a combustible is required, capable of giving out a very considerable heat, (and the cost is a matter of inferior consideration,) the carboleine will be best made from coals, coke, and brown coals, together with some animal or vegetable oil and fluid tar. If, on the contrary, the chief object is to have a combustible which, in proportion to its efficacy in heating, shall be cheaper than other materials hitherto used for that purpose, it will be necessary to make the carboleine from peat coals, mixed with oil of tar, or some bitumen. The proportion or quantities of coals and oil, to be mixed together, is to be regulated by the purpose for which the carboleine is intended, and must depend upon the greater or less degree of heat required for such purpose.

In order to manufacture a good carboleine, proceed as follows:—

First.—Take such a quantity, as may be convenient, of coal, charcoal, coke, brown coals, or peat coals,—reduce them to powder, by means of a grinding or stamping mill, and afterwards pass the pulverized material through several sieves, to render the powder as fine as possible. Put this coal powder into wooden tubes, and let it there be mixed with the animal or vegetable oil.

In order to avoid the expensive use of hydraulic or mechanical presses, to obtain a compact mass out of this mixture of powder and oil, and also, in order to concentrate

the heat and flame of the carboleine, a well-stirred loam or clay-water should be very carefully mixed with the pulverized coal, so as to saturate every atom of the powder.

Add to this mass such a proportion of oil as may be required, and mix it very carefully with the materials. These processes of mixing may be easily performed, through very simple machines; and it matters not, whether the oil is mixed with the coal-powder before or after the clay-water has been combined with it. The mass having been thus mixed, may be formed into cakes, by any convenient means, either by hand or by machines.

These cakes, when made, may be placed either in heated rooms, to dry, or in the open air.

The loam or clay-water is composed of two, or two and a half parts of water, and one part loam or clay.

The proportionate quantities of the materials, of which the different qualities of carboleine may be composed, may be stated as follows:—

For a fuel, which may be called No. 1, take twenty-four parts of coal or coke, six or seven parts of clay water, one part of oil, and one of bitumen or tar. For another artificial fuel, called No. 2, take twenty-four parts of coals or coke, six or seven parts of loam or clay water, and two parts of mineral, animal, or vegetable oil. Another fuel, No. 3, may be produced, the following proportions being observed:—Take forty parts of coal, thirty-six parts of loam or clay water, and four parts of animal, vegetable, or other oil, and mix them together, as above described.—[*Inrolled in the Petty Bag Office, January*, 1842.]

Specification drawn by Messrs. Newton and Son.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 132, Vol. XXI.)

March 15, 1842.

The President in the Chair.

"Description of the Iron Skew Bridge across the Regent's Canal, on the Eastern Counties Railway."

By Edward Dobson, Assoc. Inst. C. E.

This Bridge is built with a direct span of 54 feet, at an angle of 70° with the centre line of the canal. The level of the rails is 14 feet 6 inches above the water, and it is constructed to have a waterway of 44 feet, with a clear headway of 10 feet above the towing-path.

The dimensions of the several parts of the bridge, and the mode of putting them together, with the masonry and the cost of the construction, are described in detail, and illustrated by an elaborate working drawing.

As an appendix to this paper, a description is given of a bridge, over the same canal, on the line of the London and Birmingham Railway, on account of the similarity of its construction. The span of this latter bridge is 50 feet, but being made for two double lines of rails, it was thought expedient to have three main ribs instead of two, as in the former. The details of construction of this bridge are also given, with a drawing of one of the main ribs and its tie-bar.

"Remarks on the Ravages of the Worm *(Teredo Navalis)* in Timber."

By Robert Davison, M. Inst. C. E.

This communication describes the ravages committed by the "Teredo Navalis" upon the fir piles of the foundations of the old bridge at Teignmouth, five arches of which, after having been built only twelve years, fell suddenly; the construction of a new

bridge thus became necessary, and it is now in progress, under the direction of Messrs. Walker and Burges. The worm is described as entering the wood, through a hole not larger than a pin, and perforating the timber in all directions, but chiefly in the direction of the fibre, at the same time increasing the size of the holes, even sometimes to an inch diameter; a few of the worms had been found of the extraordinary length of 3 feet. They confine their operations between low-water mark and the bottom of the river, showing that they cannot exist out of water.

A specimen of part of a log, picked up off Jersey, was as much perforated, but in a different manner, the worms having penetrated the wood indiscriminately all over the surface; in some cases leaving in the holes a coat resembling the tail of a lobster, about 3 inches in length, which shewed that the ravages had been committed by the "Lymnoria Terebrans."

The paper was also accompanied by a specimen of wood sheathing, charged with nails, from the bottom of a vessel, believed to be about 100 years old, together with some of the worms, ("Teredo Navalis,") for the purpose of showing the peculiar shape of the head—resembling a pair of forceps, with which they cut away the wood.

"Description of the Roof of Messrs. Simpson and Co's Factory." By John Boustead, Grad. Inst. C. E.

The truss of this roof is double, consisting of two frames of Memel timber. The principals are fitted into cast-iron shoes, resting on the walls, with projections let into the wall-plates;—they taper towards the ridge, and there abut against a cast-iron ring-piece, through which a wrought-iron bolt, $1\frac{1}{4}$ inch diameter, passes, and answers the purpose of a king-post, in supporting the collar-beam. To the under side of this beam is attached a heel and eye-plate, to either end of which are linked bolts, passing between the principals, and secured by nuts at the backs of the shoes, thus forming efficient ties to resist the thrust of the principal rafters.

The slate-boards are supported by five purlins, 4 feet apart, and abut against a ridge-piece, resting on the kings.

The span of the roof is 34 feet 3 inches. The pitch is about 3 to 1, and the principals are placed 9 feet apart.

The scantlings of the principal timbers are:—Principals $9\frac{1}{2}$ by $2\frac{1}{2}$ inches, tapering to $6\frac{1}{2}$ by $2\frac{1}{2}$ inches; collar-beam 7 by $3\frac{1}{2}$ in.; purlins 6 by 4 inches; wall-plates 6 by 4 inches; slate-boards 1 inch thick; ridge-piece 10 by 2 inches.

The principals were sawn out by a template, so as to insure the given taper and the accuracy of the angles of the ends: they were then laid in a horizontal position, placed at the required angle, and the collar-beam inserted $\frac{1}{2}$ inch deep into each principal and secured by bolts $\frac{7}{8}$ inch diameter; the mode of raising the roof is then described.

Some of the advantages of roofs of this construction are stated to be, economy in materials and workmanship, with lightness and simplicity, and that all sagging of the timbers may be rectified by screwing up the nuts of the kings and shoes.

The truss is recommended for buildings where lofty apartments or coved ceilings are required, and also for its presenting so few points for the suspension of heavy weights that may subject the timbers to strains for which no provision has been made.

From the examinations that have been made, this roof seems to answer satisfactorily: it has been erected three years and a half and has sustained heavy falls of snow, but the ridge and rafters have preserved their lines perfectly, and the walls show no signs of having been subjected to undue pressure. The design of the roof is simple, its appearance light, and it may be considered an interesting specimen of the art of simple carpentry, assisted by iron-work.

A drawing of the truss accompanied the paper.

March 22, 1842.

Joshua Field, V. P. in the Chair.

"Remarks on Machines recipient of Water Power; more particularly the Turbine of Fourneyron."

By Professor Gordon. (Glasgow.)

Notwithstanding the diminished importance of water power

since the almost universal application of the steam-engine, some situations may still be found, in the mining districts of Cornwall, of Derbyshire, and of Cumberland, the Highlands of Scotland, and generally in the districts comparatively destitute of cheap fuel, where it is desirable to render falls of water available.

The theory of water power, as it now stands, may be announced in general terms thus: "The mechanical effect obtained, is equal to that of the moving power employed, minus the half of the *vis viva* which the water loses on entering the machine, and minus the half of the *vis viva* which the water possesses when it quits the machine."

Bernoulli recognized the second cause, and soon after, Euler, the first. Borda, in his "Mémoire sur les Roues Hydrauliques," in 1767, gave the proposition in precise and general terms: whence he concluded, that to produce its total mechanical effect, "the water serving as moving power, must be brought on to the wheel with impulse, and quit it with velocity."

This principle being admitted, the circumstances next to be considered, are: the height of fall—the supply of water—and the nature of the work to be done.

These positions being laid down, the author proceeds to examine the relative efficiency of water-wheels of various constructions.

Thn undershot wheel, acted upon by the velocity of the water when confined in a rectilinear course, or when hung freely in a stream. In the former case, the efficiency of the machine is equal to 32 per cent. or nearly one-third; in the latter, the ratio is 42 per cent. or about two-fifths.

The breast-wheel is generally applied to falls of from 4 to 8 feet; in these the efficiency reaches as high as 60 to 65 per cent. of the mechanical effect of the fall of water. The buckets being filled to two-thirds of their capacity, their velocity is seldom less than from 7 to 9 feet per second.

The consideration of this wheel led Poncelet in 1824-25, to the invention of the "undershot wheel with curved floats," the efficiency of which has been found equal to from 65 to 75 per cent.

The velocity of this may be 55 to 60 of that of the effluent water —a velocity equal to that due to nearly the whole height of fall; hence, the efficiency becomes "about double that of the ordinary undershot wheel." This wheel has not been much employed in Great Britain, although frequently used in France and Germany.

The overshot wheel is most generally employed in Great Britain, for falls beyond 10 feet in height, and some excellent examples occur for work of every description, from rolling iron to spinning silk. Its efficiency averages 66 per cent., but has risen as high as 82 per cent.

The economical use of water as a moving power, varying in particular cases, rendered desirable the discovery of a receiver capable of general application, in all circumstances of height of fall, quantity of water, and amount of work to be done; and after intense study, Fourneyron produced the Turbine, the peculiarities of which form the subject of the paper.

The imperfect horizontal water-wheels which have been used for centuries in the mountain districts of central Europe, and in the northern Highlands, are mentioned; then are noticed the experiments of MM. Tardy and Piebert, and the allusion by Borda to horizontal wheels; then a general description is given of the numerous experiments made up to the year 1825, when M. Burdin constructed wheels in which the water was received at the circumference of a vertical cylinder, descended in conduits, placed in a helical form round the surface of the cylinder, and made its escape at the bottom; the efficiency of these wheels was stated to be 75 per cent., but no exact experiments were ever instituted.

The defects in all the previous machines led to the invention of the Turbine, as it is now designed by M. Fourneyon; its construction may be compared to one of Poncelet's wheels, with curved buckets, laid on its side, the water being made to enter from the interior of the wheel, flowing along the buckets, and escaping at the outer circumference; centrifrugal force here becomes a substitute for the force of gravity.

The mechanical construction of the Turbine is then given, and its action is thus described. The water, when admitted to the

reservoir, rises to a certain level, exercising a hydrostatic pressure, proportional to the height of the column, and on the sluice being raised, it escapes with a corresponding velocity in the direction of the tangent, to the last element of the guide curves, which is a tangent to the first element of the curved buckets;—the water pressing without shock upon the buckets at every point of the inner periphery, causes the wheel to revolve,—then passes along the buckets, and escapes at every point of the outer periphery; by which arrangement, the size of the machine, even for a large expenditure of water, is kept within narrow limits.

The advantages of the Turbines are stated to be—

1st. That they are with like advantage applicable to every height of fall, expending quantities of water proportional to the square root of the fall, their angular velocities being likewise proportional to these square roots.

2nd. That their net efficiency is from 70 to 75 per cent.

3rd. That they may work at velocities much above or below that corresponding to the maximum of useful effect, the useful effect varying very little from the maximum nevertheless,—and

4th. They work at considerable depths under water, the relation of the useful effect, produced to the total mechanical effect expended, not being thereby notably diminished.

These advantages are stated to have been realized in the extensive practice of M. Fourneyron, of M. Brendel, in Saxony, and and of Herr Carliczeck, in Silesia, as well as other engineers.

A comparison of the theory and practice of the construction is then instituted, and the following conclusion is drawn:—That if one Turbine has been constructed, which works well under a known fall, expending a volume of water exactly measured, this Turbine would serve as a type for all others.

Knowing the fall and the volume of the water to be expended, the Turbine would be made similar to its type. Its linear dimensions would be those of the type, directly as the square roots of the volume of water, and inversely as the fourth roots of the heights of fall. Its angular velocity would be to that of the type, directly as the fourth roots of the cubes of the heights of fall, and inversely as the square roots of the volumes of water. These

practical rules were first made manifest by M. Combe, of the Ecole des Mines.

A general review is then given of most of the Turbines, erected by M. Fourneyron, at Pont sur l'Ognon, at Fraisans, at Niederbronne, and at Inval, upon which last were tried the experiments which completely established the reputation of the Turbine as an applicable machine. The details of these experiments are given, whence the mean results appear to be, that the height of fall being 6 feet 6 inches—

With an expenditure of 35 cube feet of water per second, the efficiency was— = 0·71

,,	63 cube feet	,,	=	0·75
,,	79 ,,	(for which it was constructed)	=	0·87
,,	126 ,,		=	0·81
,,	144 ,,		=	0·80

These experiments were tried by the application of Prony's Brake Dynamometer, to the vertical shaft of the Turbine itself.

M. Arago's proposition for employing the power of one branch of the river Seine upon Turbines, to replace the wheels at the Pont Nôtre Dame, thus giving about 2000 horse power for supplying Paris with water, is then mentioned, as also the results of experiments with very low falls; showing that—

With a fall of 3 feet 9 inches, the efficiency of the Turbine was— = 0·71

,,	2 feet	,,	=	0·64
,,	10 inches	,,	=	0·38

The Turbines, at Müllbach and Moussay, are mentioned, as are the failures of several of these machines, constructed by other engineers; and the paper concludes with an account of a Turbine at St. Blazeux, in the Black Forest, where the height of the fall is 345 feet, the quantity of water 1 cube foot per second, and the reported efficiency from 80 to 85 per cent.

Mr. Taylor said, that Professor Gordon's Paper, on the Turbine, had been brought before the Institution, with the advantages of illustration afforded by the model, made under the superintendence of Mr. Jordan, for the Museum of Economic Geology,

a most useful institution; for the present advanced state of which the country is in a great degree indebted to the zeal and scientific knowledge of Mr. De la Bèche, who conducts the geological survey of the kingdom, ordered by the Board of Ordnance.

The Institution was indebted to the courtesy of Mr. De la Bèche, for the exhibition of the model, and Mr. Taylor had been anxious that the subject should be brought forward at this time, as the only period at which such a permission could have been granted; for models, once deposited in the Museum, were not alllowed to be removed. But it had been arrested, in its passage, from the hands of the maker, and thus had been procured for the inspection of members of the Institution.

Mr. Taylor then proceeded to remark, that, although the improvements in the application of steam had rendered water-power of less value than formerly, yet there were many situations, particularly in the mining and the highland districts, where it was still employed beneficially. And, as an instance of the extent to which water-power might be applied, he mentioned a case in Devonshire, where, in the adjoining mines of Wheal Betsy and Wheal Friendship, near Tavistock, which have, for many years, been under his management, a fall of water of 526 feet in height, is employed in giving motion to seventeen over-shot wheels, eight of them performing the duties of pumping water from a depth of nearly 200 fathoms. The diameter of the largest of these wheels being 51 feet, with a width of breast of 10 feet clear, within the rings; the smallest of the eight being 32 feet diameter, and the others of intermediate sizes.

Four other wheels give motion to machines, for drawing up the ores to the surface, their diameters varying from 40 to 26 feet, and the five remaining wheels are employed for mills for crushing and stamping the ores. In addition to all this power, a steam-engine, with a cylinder of 80 inches diameter, and 10 feet stroke, is provided as an auxiliary, in periods of drought or frost.

He then gave the distribution of this water-power, in the following tabular form:—

Overshot Water Wheels employed in pumping water at Wheal Friendship Lead and Copper Mines, near Tavistock, in July, 1841.

From Data furnished by Mr. Anthony Rouse, Engineer at those Mines.

All the wheels operate on their pumps by means of a simple crank, formed on each end of the centre axis or gudgeon, on which the wheel is mounted. Two long rods extend, nearly in a horizontal direction, from the pins of those cranks, to the upright arms of two bell crank or elbow levers, which are situated at the mouth of the pit or shaft, and, from the horizontal arms of those elbow levers, two vertical pump-rods are suspended in the pit. Those rods and the pump-work are the same as commonly used for steam-engines in Cornwall, with plunger pumps, except that there are two pump-rods in each pit, and they move up and down in contrary directions, owing to the two cranks on the ends of the axis of the water-wheel being bended in opposite directions; by that arrangement the weight of the two rods counterbalance one another; one half of the pumps are connected to one rod, and the other half to the other rod, and the water is raised in the pumps by turns. All the wheels have a considerable length of horizontal rods, to extend from their cranks to the elbow of bell-crank levers at the pit's mouth; and in some cases, a very considerable length of such rods, occasioning much friction.

I. *Old Sump Wheel*, 51 feet in diameter, 10 feet broad. The water poured into its buckets was at the rate of 5632 gallons per minute; which, at 10 lbs. per gallon, would be 56,320 lbs. weight, descending 51 feet = 2,872,320 lbs. per minute descending 1 foot; that is, the power of the water expended,—or, being divided by 33,000 lbs. (for a horse power, according to Mr. Watt,) gives 87·0 horse power expended.

The wheel, when so supplied, made 5 revolutions per minute, and worked 6 pumps, as follows:—

Lifts.	Fath.	Feet.	Diam.	Weight.
1	43 ,,	$1\frac{2}{3}$	$13\frac{1}{2}$	16 136
3	112 ,,	$3\frac{1}{2}$	13	38 922
1	25 ,,	3	14	10 225
1	6 ,,	5	9	1 132
				66 415

The length of stroke in the pumps was 6 feet; and the effective motion in the pumps to raise water, was at the rate of 30 feet per minute.

The weight of the columns of water in all the 6 pumps, amounted to 66,415 lbs. weight, which being raised 30 feet per minute = 1,992,450 lbs. per minute raised 1 foot; that is, the power realized or exerted in actually raising the water; or being divided by 33,000, gives 60·36 horse power realized.

Wherefore an expenditure of water power equal to 2,872,320 lbs. per minute, descending 1 foot (or 87·0 H. P.) produced a useful effect, realized in water raised by the pumps, equal to 1,992,450 lbs. per minute raised 1 foot (or 60·36 H. P.). The useful effect or work done, being at the rate of 69·4 per cent. of the power expended, the remaining 30·6 per cent. being lost, partly by friction of the pump-work, and resistance to the motion of the water through the pumps, and partly by imperfect application of the water to the wheel.

II. *Taylor's North Wheel*, 50 feet diameter, $6\frac{1}{3}$ feet broad, was supplied with 5,199 gallons of water per minute = 78·75 H. P. expended. It made 5 revolutions per minute, and worked 6 pumps with a stroke of 6 feet; weight of the columns of water in those pumps, 44,689 lbs., which was raised 30 feet per minute = 40·63 H. P. realized; being 51·6 per cent. of the power expended.

III. *Taylor's South Wheel*, 40 feet diameter, $4\frac{1}{3}$ feet broad; supplied with 4167·4 gallons = 50·5 H. P. expended. It worked 2 pumps, 6 feet stroke, 5 strokes per minute; weight of columns 30,270 lbs. = 27·53 H. P. realized; being 54·5 per cent.

IV. *Brenton's Wheel*, 32 feet diam., $7\frac{1}{3}$ feet broad; supplied with 8897·4 gallons = 86·3 H. P. expended. It worked 5 pumps, 6 feet stroke, $4\frac{1}{2}$ strokes per minute; weight of column 30,092 lbs. = 24·63 H. P. realized; being only 28·5 per cent. of the power expended, which is to be accounted for, by the additional friction of a great length of horizontal rods by which this wheel works its pumps.

Overshot Water Wheels at Wheal Betsy Mines, in July, 1841.

I. *Job's Wheel*, 42 feet diam., supplied with 2890 gallons of water per minute = 36·78 H. P. expended. It made 4 revolutions per minute. Weight of the columns of water in the pumps 28,314 lbs. 6 feet stroke = 20·6 H. P. realized, being 56 per cent.

II. *Williams's Wheel*, 40 feet diam.; 3027 gallons per minute = 36·68 H. P. expended. It made $4\frac{1}{2}$ revolutions. Weight of columns 26,454 lbs.; $7\frac{1}{3}$ feet stroke = 26·45 H. P. realized; being 72·1 per cent.

III. *Buller's Wheel*, 40 feet diam., 1912 gallons = 23·17 H. P. expended. It made 3 revolutions. Weight of columns 22·901 lbs. $7\frac{1}{2}$ feet stroke = 15·61 H. P. realized; being 67·4 per cent.

IV. *Carpenter's Wheel*, 44 feet diam., 1985 gallons = 26·46 H. P. expended. It made $4\frac{1}{2}$ revolutions. Weight of columns 18,662 lbs., 6 feet stroke = 15·26 H. P. realized; being 57.6 per cent.

Conclusion.—If Brenton's Wheel at Wheal Friendship is rejected, as an extreme case, the average performance of the other three wheels, at Wheal Friendship, will be 58·5 per cent.; and of the four wheels, at Wheal Betsy, 63·3 per cent. Or the average performance of all the seven wheels, will be 61·2 per cent.

Wheal Friendship.	Old Sump . . .	69·4	58·5 per cent.
	Taylor's North .	51·6	
	Taylor's South .	54·5	
Wheal Betsy.	Job's	56·0	63.3 per cent.
	Williams's . . .	72·1	
	Buller's	67·4	
	Carpenter's . . .	57·6	

Mr. Jordan described the Turbine to consist of three principal parts.—

1st. A cylinder with a base, upon which are fixed the guide curves, directing the water at a certain angle upon the buckets of the moving ring.

2nd. A sluice, regulating the flow of water from the bottom of the cylinder upon the buckets; and—

3rd. The external or revolving ring, with its buckets and its upright shaft, whence the motion is communicated to the machinery to be driven.

The buckets are confined between two annular plates, the lower one being attached to the vertical shaft, in the bottom of which, is fitted a hardened steel thimble, into which a pivot of "glass-hard-steel" works; this inversion of the ordinary arrangement of the pivot, is to prevent any particles of sand or other substances from getting upon the point, and producing friction. Oil is introduced to this pivot by a tube connected with a small pump, worked by the machinery at the requisite speed, to keep it lubricated.

The form of the buckets is a mathematical curve, and on the perfection with which this is traced, will depend the efficiency of the Turbine.

These parts are enclosed within a cylinder, so arranged that it shall serve as the reservoir, whence the water is admitted upon the moving parts by the sluice, which must be well fitted to prevent a loss of water, and is uniformly raised or lowered by gearing, placed on the top of the cylinder. When the height of the fall is considerable, the cylinder is closely covered, and the moving shaft passes through a stuffing box in the centre; but with low falls, the cylinder is open at the top.

A great advantage in the machine is, that the castings and ironwork composing it, are (with the exception of the buckets) very simple, they require little adjustment, and only a few parts are turned or bored, so that the construction ought to be economical.

Mr. Rennie had endeavoured to introduce the Turbine into notice some years ago, and the nature of the curves had been examined in an article in Herapath's Magazine. Professor Gordon's statement corresponded very nearly with what he had heard from MM. Fourneyron, Arago, and Morin, and subsequently seen of these machines when in France. He had visited a Turbine, erected by a Mr. Isterwood, at a flour-mill at St. Maur, near Paris; the machine drove ten pairs of millstones, 3 feet 4 inches in diameter, at the rate of two hundred revolutions per minute,

equalling forty horses' power: subsequently, three additional Turbines were erected, for the purpose of driving ten pairs of stones each, or in all, forty pairs of stones, by four machines.—Each Turbine had a diameter of 5 feet 2 inches, and a depth of bucket of 8 inches, with a fall of water of about 6 feet: when entirely submerged to the depth of 4 feet, the Turbine continued to make (as in low water) 50 revolutions per minute.

Subsequently, in September 1840, he visited the flour-mills of M. D'Arblay, at Corbeil. These mills are four in number, arranged in a quadrangular form; each mill contains ten pairs of mill-stones, which were originally driven by four well-proportioned cast-iron wheels, of about 18 feet diameter; two out of the four wheels were still at work, but the other two had been replaced by two Turbines, similar in dimensions to those at St. Maur. One of them was working ten pairs of stones. The motion was communicated to a horizontal shaft, by means of bevil wheels, one fixed on the upper extremity of the upright spindle of the Turbine, the other, of smaller diameter, fixed on the end of the horizontal shaft, on which also were fixed the riggers, for driving, by means of straps, smaller riggers, fixed on the mill-stone spindles. The work was very regularly done, and the proprietors expressed great satisfaction. The second Turbine was then erecting, and the third and fourth water-wheels were to be replaced by similar machines. No fault was attributed to the original wheels, but their effect was not equal to that of the Turbines. The maker (Mr. Isterwood) stated that he had made these machines entirely under the direction of M. Fourneyron, who alone knew how to trace the directing and emissive curves, and that, unless they were properly described, the effect would be greatly reduced. He at the same time stated, as his opinion, that there was no economy in the construction of the Turbine over the common water-wheel, as the former is more complicated and costly. M. Fourneyron seemed to doubt whether any other machinist than himself could construct a Turbine properly; the principal difficulty being in tracing the curves, which had been the study of his life; he quoted several instances of failure when

strangers had attempted their construction. M. Arago and M. Poncelet were of the same opinion: the former stated, that the effect of the curves was contrary to theory. M. Morin expressed his confidence in the accuracy of the experiment made with the *frene* or friction brake of Prony, applied to the axes of the Turbines.

Mr. Rennie had seen a cast-iron water-wheel, with close buckets, very nicely balanced, 21 feet diameter and 5 feet 6 inches wide, made under the direction of his father, realize 80 per cent. of effective power, and Professor Gordon, in the paper, spoke of 82 per cent. for an overshot water-wheel. He did not, however, by these observations, mean to disparage the Turbine, with which the mechanical world generally was not sufficiently acquainted.

Mr. Taylor thought, that Mr. Rennie had overlooked the two prominent advantages of the Turbine, in comparing it with other methods of employing water power.

1st. That of its being equally adapted for very low or for very high falls: in falls under 10 feet, the breast-wheel afforded but an imperfect mode of using the power, as the actual efficiency fell far below what ought to be obtained by a more perfect machine; and in falls above 50 or 60 feet, if overshot wheels were used, a number of them must be constructed, with the disadvantage of increased expense, and probable inconvenience in their application. Instances had been adduced of Turbines working with a fall as low as 2 feet, and as high as 345 feet; the efficiency of the former, being stated at 64 per cent. and of the latter, from 80 to 85 per cent.

2nd. That they are not affected by back or tail water, like almost all other hydraulic machines; it having been shown by direct experiment, that, when working at considerable depths under water, the relative proportion of useful effect produced, to the total mechanical effect expended, is not thereby notably diminished. This, in his opinion, was one of the most important advantages of the Turbine.

For high falls, the water-pressure engine and Barker's mill, as improved by Whitelaw and Stirratt, rivalled the Turbine; and

for low falls, there were many machines which were very effective: for instance, the balance-engine, and the old "flap-jack," with a reservoir of water at one end of the beam, and a pump at the other; he had seen such a machine working with a ten-foot stroke, pumping from a depth of 200 fathoms—but for falls, subject to great fluctuation, none of these machines appeared to equal the accounts given of the Turbine.

Mr. Farey had not collected from the paper, or the discussion, how the quantity of water, passing through the Turbine, had been measured. The power exerted appeared to have been tried, by a brake applied directly to the axis of the Turbine, whereas ordinary water-wheels are usually tried by the work which they actually do perform, and that by the intervention of machinery which causes a considerable loss of power by friction; in order to make a fair comparison, the two kinds of machines should have been experimented upon exactly in the same manner, which did not appear to have been done.

When Mr. John Taylor stated, that the effect of the best of the large water-wheels, used for pumping water out of the mines, under his management, had been calculated to be 69 per cent. of the power expended, it would be found that the effect produced had been computed by the weight of the columns of water in the pumps, multiplied by the height through which such weight was raised; such being the usual mode of reckoning. But it is obvious, that much more power was exerted by the water-wheel than would thereby be brought to account in the 69 per cent., owing to the friction of the pit-work and pumps, by which the water was raised. The Turbines appear to have been tried in a way which would not incur much of that loss, but which would bring to account, in the per-centage, nearly all the power which, in practical operations, must be lost by the friction of the machinery, with which a water-wheel or a Turbine must of necessity be connected, in order to perform such operations.

List of Patents

Granted by the French Government from the 1st of October to the 31st of December, 1810.

PATENTS FOR FIFTEEN YEARS.

Miles Berry, of London, representated in Paris, by M. Perpigna, advocate, of the French and Foreign Office for Patents, No. 2, ter. Rue Choiseul,—for improvements in looms.

Borgne, represented in Paris by M. Perpigna, advocate, for a method of directing balloons.

Coates, represented in Paris by M. Perpigna, advocate, for a machine for manufacturing pins and setting them in paper.

Davies, represented in Paris by M. Perpigna, advocate, for improvements in wheels for rail-roads and common roads.

Ducel and Viry, represented in Paris by M. Perpigna, advocate, for improvements in the reduction of iron ores.

Forbes Orson, represented in Paris, by M. Perpigna, advocate, for improvements in the manufacturing of staves, laths, &c.

Gaubert and Mazure, represented in Paris, by M. Perpigna, advocate, for a machine for composing and distributing type.

Graves, represented in Paris by M. Perpigna, advocate, for a machine for manufacturing cords and strings.

Greenwood, represented in Paris by M. Perpigna, advocate, for improvements in looms.

Perret, represented in Paris by M. Perpigna, advocate, for a new press.

Williamson, represented in Paris by M. Perpigna, advocate, for improvements in locks.

Willoughby, represented in Paris by M. Perpigna, advocate, for improvements in the making of hinges.

Archbald, of la Chapelle, St. Denis, for improvements in soap.

Arnold, of London, for a composition to prevent the oxidation of metals.

Beringier and Collas, of Paris, for a method of manufacturing nails for horse-shoes, &c.

Bertin, of Bordeaux, for improvements in the bleaching of sugar.

Brent, of Paris, for motive power, applicable to rail-roads, canals, and common roads.

Biron, Allaud, and Perrin, of Avignon, for an extraction of the colouring substance from madder.

Bosquillon, of Paris, for improvements in Jacquard frames.

Cartier, of Marseilles, for the manufacture of soap from the lees of olive oils.

Driollet, of Paris, for wheels with concentric metallic springs.

Duprat de Tressoz, of Paris, for a mode of noting down the music performed on the piano-forte.

Duquesne and Coffyn, of Valenciennes, for a process for obtaining a higher temperature in blast furnaces.

Elkington, of London, for a process for silvering metals.

Feburier, of Paris, for a new steam-engine.

Fould, of Paris, for a process for extending window-glass.

Frimot, of Paris, for new boilers and steam-engines.

Gandillot, of Paris, for a complete system for manufacturing tubular iron bars.

Garret, of Paris, for a machine for making bricks.

Guitard, of Paris, for an improved method of extracting starch from potatoes.

Herrypon, of Paris, for ferruginous bread.

Irving, of London, for a method of giving signals.

Jozeau and Mège, of Paris, for a new kind of specific against certain diseases.

Le Dreuille, of Paris, for a new motive power.

Lemard, of Paris, for a new apparatus to be substituted to paddle-wheels.

Le Marquis de Louvois and Leclère, of Paris, for a boat in sail-cloth.

Méaume, of Paris, for an apparatus for taking vapour-baths.

Parriaux, of Paris, for improvements in water-wheels.

Perkins, of London, for improvements in the heating of boilers.

Peyron, of Marseilles, for electro-magnetic motive power.

De Précorbin, of Paris, for the means of economising fuel in blast furnaces.

Robertson, of London, for a method of obtaining motive power.

Rodier, of Paris, for improved animal soap.

Roumieu, Montpriert, of Madrid, for a new system for grinding corn.

Schweisguth Condray, of Mulhouse, for the manufacture of indigenous indigo.

Sorel, of Paris, for an engine to be worked by steam or air.

Talbot, of Louviers, for an improved hydraulic engine.

Teyssier, of Milhau, for a pomatum for sharpening razors.

Valson, of Givrey, for an improved towing boat.

Wilson, of London, for improvements in the manufacture of carbonate of soda.

Wotfel, of Paris, for improvements in pianos.

Young, of London, for an apparatus for setting-up types,

PATENTS FOR TEN YEARS.

Beaurepaire, (Le Comte de) represented by M. Perpigna, advocate of the French and Foreign Office for Patents, 2 ter. Rue Choiseul, for a surgical apparatus for the cure of certain diseases.

Benkler and Ruhl, represented by M. Perpigna, advocate, for a new lamp.

Binyon, represented in Paris by M. Perpigna, advocate, for improvements in the printing of tissues.

Douret Brothers, represented in Paris by M. Perpigna, advocate, for hygienic drawers, for ladies.

Fisher, represented in Paris by M. Perpigna, advocate, for improvements in bobbin net frames.

Heck, represented in Paris by M. Perpigna, advocate, for a new substance for brewing beer.

Hugo, represented in Paris by M. Perpigna, advocate, for improvements in the making of artificial flowers.

Laumonier, represented in Paris by M. Perpigna, advocate, for manufacturing animal black.

Leistenschneider and Noirot, represented in Paris by M. Perpigna, advocate, for a machine for cutting mill-stones.

Nérot, represented in Paris by M. Perpigna, advocate, for a new process for filtering.

Newton, of London, represented in Paris by M. Perpigna, advocate, for an improved machine for pulverising dye-wood.

Parod, represented in Paris by M. Perpigna, advocate, for a machine for making trellice work.

Pierre Pierron, represented in Paris by M. Perpigna, advocate, for a new method of mounting bells.

Rupert, Smedley, represented in Paris, by M. Perpigna, advocate, for improvements in the manufacturing of tubes.

Rossignon, represented in Paris by M. Perpigna, advocate, for an improved hydraulic machine.

Smith, represented in Paris by M. Perpigna, advocate, for improvements in the construction of rail-roads.

Suarce, (Le Baron de) and Favre, represented in Paris by M. Perpigna, advocate, for a new system of sawing dye-woods.

Vickers, represented in Paris by M. Perpigna, advocate, for an improved apparatus for propelling vessels.

Vegni, represented in Paris by M. Perpigna, advocate, for the manufacturing of metallic cords, to be used in mines.

Anrès, of Paris, for a process for giving an old appearance to stone.

Bainbridge, of London, for a means of increasing any motive force.

Becker, of London, for improvements in engraving.

Belliol, of Paris, for a new alimentary substance, called "Indian *tanakoub.*"

Bertrand, of Elbeuf, for improvements in Jacquard frames.

Blanchard and Poret, of Paris, for improvements in gas apparatus.

Blondeau de Carolles, of Paris, for a new method of producing gas for illumination.

Bouillant, of Paris, for a process for manufacturing iron wire.

Boudot, of Paris, for improved clasps.

Brunet and Brigandin, of Paris, for improvements in pumps.

Campiche and Saget, of Paris, for a new system ef illumination.

Champion, of Paris, for linear and semi-metallic measures.

Chariot, of Bordeaux, for a new method of tightening the shrouds of ships.

Chapny, of Lyons, for improvements in gas-meters.

Chassagne de Francséjour, of Paris, for purgative pills.

Chaussenot, of Paris, for apparatus for preparing gaseous liquids.

Chevalier, of Bordeaux, for boxes for the preserving of alimentary substances.

Clare, of London, for improvements in steam navigation.

Cogniet, of Lyons, for a new mode of sweeping chimnies.

Cordiet, of Paris, for a new loom.

Dangles, of Lyons, for improvements in umbrellas.

Della-Janna, of Vienna, for an improved apparatus for pulverizing plaster.

Duval, of Paris, for a new safety apparatus.

Fervaecke, of Ghent, for an improved method of writing.

Fisher, of London, for a frame for making bobbin net.

George and Parry, of Paris, for a cabriolet which cannot be upset.

Grillet, of Lyons, for improvements in the manufacturing of fringe for shawls.

Hall-Greive, of Valenciennes, for improvements in the manufacturing of carbonate of lead.

Hardempont, of St. Quentin, for improvements in the filtering of animal oils.

Hennecart, of Paris, for improvements in the manufacture of gauze, for the purposes of colting.

Hermet, of Paris, for a new horse-collar.

Lassalle and Brandely, of Paris, for an apparatus for heating rooms and houses.

Le Couppey, of Paris, for improvements in stringed instruments.

Lemoine, of Loche, for a wine press.

Lesseré, of Paris, for a new ink-stand.

Maillé and Masson, of Autun, for a machine for propelling vessels.

Martin, of Toulouse, for an instrument called "chiragymnaste."

Matchett and Moore, of Birmingham, for improvements in the manufacturing of hinges.

Mellet Brothers and Faulquié, of Lodève, for a machine for washing wool.

Meurs, of Valenciennes, for an improved weighing machine.

Meyers, of London, for improvements in the manufacturing of candles.

Meynard, of Volréas, for a machine for spinning silk.

Milleret, of Paris, for water for the toilet.

De Montfleury and Co., of Elbeuf, for an apparatus for carding wool.

Mottet, of Paris, for an improved umbrella.

Neppel and Guérin, of Nevers, for artificial grinding stones.

Normand, of Paris, for a typographic press.

Nunn, of London, for impermeable stuffs and leathers.

Oechelhauser, of Siégen, (Prussia,) for a machine for manufacturing continuous paper.

Pearson and Walkland, of Calais, for improvements in bobbin-net frames.

Pellet and Berthomène, of Bordeaux, for an improved mode of moulding with hydraulic cement.

Piet, of Paris, for the manufacture of impermeable cloth, which can be used as plush for hats.

Poncy-Hian, of Paris, for a new process of tanning.

Poole, of London, for a machine for cutting paper.

Poole, of London, for improvements in the manufacturing of paper.

Poole, of London, for improvements in typographic impressions.

Poole, of London, for a lithographic machine.

Poole, of London, for improved fuel.

Poole, of London, for improvements in beds.

Poole, of London, for an improved process for the production of starch.

Poole, of London, for improvements in the construction of hinges.

Potts, of Birmingham, for a new mode of suspending pictures.

Prélat, of Paris, for an apparatus to destroy the gas in mines.

Reverchon Sons, and Pascal, for a new mode of towing waggons on rail-roads.

Robert, of Tarrare, for new bobbins and spindles.

Ruffat, of Limous, for a machine for fulling cloth.

Ryton, of Paris, for a filtering apparatus.

Sautreuil, of Fécamp, for a process for twisting the wood used for balusters of stairs.

Sangouard, of Paris, for a new instrument, applicable to the manufacturing of tissues.

Szymanski, of Paris, for improved water-closets.

Trablit, of Paris, for a process for the use of Balm of Toulou.

Truffaut, of Paris, for an extraction of tannin from animal and vegetable substances.

White, of Sittingbourne, for an economical stove.

Wright, of London, for improvements in steam-engines, for raising water.

List of Patents

That have passed the Great Seal of IRELAND, from the 25th August to the 13th of September, 1842, inclusive.

To James Warren, of Montague-terrace, Mile End Road, in the county of Middlesex, Gent., for an improved machine for making screws.—Sealed 25th August.

Thomas Cuthbert Cockson and George Bell, of the City of Dublin, merchants, for certain improved machines, which facilitate the drying of malt, corn, and seeds; also the bolting, dressing, and separating of flour, meal, and all other substances requiring to be sifted.—Sealed 1st September.

William Hancock the Younger, of Amwell-street, in the county of Middlesex, Gent., for certain improvements in combs and brushes.—Sealed 6th September.

Henry Clarke, of Drogheda, in the county of Louth, linen merchant, for improvements in machinery for lapping and folding all descriptions of fabrics, whether woven by hand or power.—Sealed 13th September.

William Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for an invention of certain improved machinery for excavating, dredging, and removing earthy and stony matters, in the construction of railroads, canals, cleaning of rivers, harbours, and redeeming of marshy or alluvial soils; also for boring rocks, indurated clay, and other earthy matters, for the purpose of blasting and removing the same; the whole to be worked by steam and other power,—being a communication.—Sealed 13th September.

List of Patents

Granted for SCOTLAND, subsequent to August 22nd, 1842.

To Job Cutler, of Lady Pool Lane, in the Borough of Birmingham, Gent., for improvements in the construction of tubular flues for steam-boilers, and in the manufacture of tubes for such and other purposes.—Sealed 23rd August.

Henry Barclay, of Bedford-row, in the county of Middlesex, dentist, for a composition or compositions, applicable as tools or instruments for cutting, grinding, or polishing glass, porcelaine, stones, metals, and other hard substances.—Sealed 25th August.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in machinery or apparatus for making or manufacturing screws, screw-blanks, and rivets,—being a communication from abroad.—Sealed 31st August.

Eugene De Varroc, of Bryanstone-street, Portman-square, in the county of Middlesex, Gent., for apparatus to be applied to chimnies, to prevent their taking fire, and for rendering sweeping of chimnies unnecessary.—Sealed 1st September.

Thomas Marsden, of Salford, in the county of Lancaster, machine maker, and Solomon Robinson, of the same place, flax dresser, for improvements in machinery for dressing or heckling flax and hemp.—Sealed 1st September.

Samuel Morand, of Manchester, merchant, for improvements in machinery or apparatus for stretching fabrics.—Sealed 1st September.

William Henry Kempton, of South-street, Pentonville, in the county of Middlesex, Gent., for improvements in the manufacture of candles.—Sealed 2nd September.

John George Hughes, of No. 158, Strand, in the county of Middlesex, general agent, for a new application of telegraphic signals, and the mode of applying the same.—Sealed 2nd September.

Joseph Whitworth, of Manchester, in the county of Lancaster, engineer, for certain improvements in machinery or apparatus for cleaning roads, and which machinery is also applicable to other similar purposes.—Sealed 2nd September.

John Thomas Betts, of Smithfield Bars, in the city of London, Gent., for improvements in covering and stopping the necks of bottles and other vessels,—being a communication from abroad.—Sealed 8th September.

Isham Baggs, of Wharton-street, in the county of Middlesex, chemist, for improvements in obtaining motive power, by means of carbonic acid.—Sealed 8th September.

New Patents
SEALED IN ENGLAND.
1842.

To Charles Frederick Guitard, of Birchin-lane, notary public, for certain improvements in the construction of railways.—Sealed 31st August—6 months for inrolment.

Charles Thatcher, of Midsomer Norton, Somerset, brewer, and Thomas Thatcher, of Kilmersdon, in the said county, builder, for certain improvements in drags or breaks, to be applied to the wheels of carriages.—Sealed 31st August—6 months for inrolment.

Robert Hazard, of Clifton, near Bristol, for improvements in ventilating carriages, and cabins of steam boats.—Sealed 3rd September—6 months for inrolment.

William Rocke, of Princes-end, Stafford, mechanic and engineer, for improvements in the manufacture of mineral colors.—Sealed 3rd September—6 months for inrolment.

William Warburton, of Oxford-street, in the county of Middlesex, Gent., for improvements in the construction of carriages, and apparatus for retarding the progress of the same.—Sealed 8th September—6 months for inrolment.

John Wordsworth Robson, of Jamaica-terrace, Commercial-road,

engineer, for certain improvements in machinery and apparatus for raising, forcing, conveying, and drawing off liquids.—Sealed 8th September—6 months for inrolment.

James Insole, of Birmingham, sadlers' ironmonger, for improvements in the manufacture of brushes.—Sealed 8th September —6 months for inrolment.

Joseph Henry Tuck, of Francis-place, New North-road, engineer, for certain improvements in machinery or apparatus for making or manufacturing candles. — Sealed 8th September — 6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in machinery or apparatus for making or manufacturing screws, screw-blanks, and rivets,—being a communication.—Sealed 8th September—6 months for inrolment.

Herbert, George James, of Great Tower-street, in the city of London, merchant, for certain improvements in machines or apparatus for weighing various kinds of articles or goods,—being a communication.—Sealed 8th September—6 months for inrolment.

William Fothergill Cooke, of Copthall-buildings, Esq., for improvements in apparatus for transmitting electricity between distant places, which improvements can be applied amongst other purposes, to apparatus for giving signals, and sounding alarums at distant places, by means of electric currents.—Sealed 8th September—6 months for inrolment.

Thomas Thirlwall, of Low Felling, Durham, engine-builder, for certain improvements in lubricating the piston rods of steam-engines, and of other machinery.—Sealed 8th September—6 months for inrolment.

William Crofts, of New Radford, Nottingham, lace machine-maker, for improvements in the manufacture of figured or ornamented lace.—Sealed 8th September—6 months for inrolment.

Thomas Marsden, of Salford, in the county of Lancaster, machine-maker, and Solomon Robinson, of the same place, flax

dresser, for improvements in machinery for dressing or heckling flax and hemp.—Sealed 8th September—6 months for inrolment.

James Wake, Junr., of Goole, in the county of York, coal-factor, for certain improvements in propelling vessels.—Sealed 9th September—6 months for inrolment.

John Rolt, of Great Cumberland-place, Esq., for certain improvements in saddles.—Sealed 15th September—6 months for inrolment.

Frederick Bowles, of Moorgate-street, London, for a new method, by machinery, of preparing flour from all kinds of grain and potatoes, for making starch, bread, biscuit, and pastry,—being a communication.—Sealed 15th September—6 months for inrolment.

Christopher Nickels, of the York-road, Lambeth, Gent., and Caleb Bedells, of Leicester, manufacturer, for improvements in fabrics produced by lace machinery.—Sealed 15th September—6 months for inrolment.

William Henry James, of Martin's-lane, civil engineer, for certain improvements in railways and carriage-ways, railway and other carriages, and in the mode of propelling the said carriages, parts of which improvements are applicable to the reduction of friction in other machines.—Sealed 16th September—6 months for inrolment.

John Sanders, William Williams, Samuel Lawrence Taylor, and William Armstrong, all of Bedford, agricultural implement makers; and Evan William David, of Cardiff, for improvements in machinery for ploughing, harrowing, and raking land, and for cutting food for animals.—Sealed 22nd September—6 months for inrolment.

Patrick Stead, of Halesworth, Suffolk, malster, for improvements in the manufacture of malt.—Sealed 22nd September—6 months for inrolment.

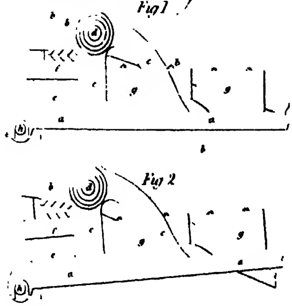
John Juckes, of Putney, Gent., for improvements in furnaces.—Sealed 22nd September—6 months for inrolment.

CELESTIAL PHENOMENA FOR OCTOBER, 1842.

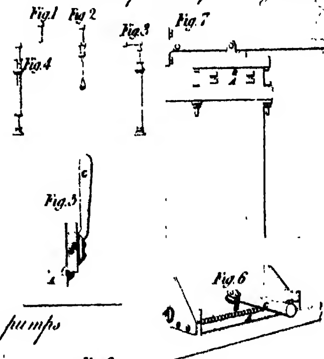
D.	H.	M.	
1			Clock after the sun 10m. 17s.
—			☽ rises 2h. 4m. M.
—			☽ passes mer. 9h. 14m. M.
—			☽ sets 4h. 5m. A.
1	5	53	♄ in □ with the ☉
1	16	53	♂ in conj. with the ☽ diff. of dec. 5. 38. N.
2	9	22	♃'s first satt. will em.
2	22		☽ in Perigee.
4	6	24	Ecliptic conj. or ● new moon.
5			Clock after the sun, 11m. 30s.
—			☽ rises 7h. 58m. M.
—			☽ passes mer. 0h. 48m. A.
—			☽ sets 5h. 26m. A.
	14	37	☿ in conj. with the ☽ diff. of dec. 2. 6 N.
7	4	34	♀ in conj. with the ☽ diff. of dec. 0. 5. N.
	7	30	♃ in □ with ☉
7	18	41	☿ greatest elong. 25. 7. E.
8	11	2	♀ greatest elong. 46. 42. E.
10			Clock after the sun 12m. 54s.
—			☽ rises 1h. 42m. A.
—			☽ passes mer. 5h. 31m. M.
—			☽ sets 9h. 26m. A.
	1	5	♄ in conj. with the ☽ diff. of dec. 1. 2. N.
	12	40	♃ in conj. with ☽ diff. of dec. 0. 14. S.
11	5	46	♃'s first satt. will em.
11	6	41	☽ in □ or first quarter.
13	17	23	☿ greatest Hel. Lat. S.
14	7	41	♃'s second satt. will em.
15			Clock after the sun, 14m. 6s.
—			☽ rises, 3h. 27m. A.
—			☽ passes mer. 9h. 14m. A.
—			☽ sets 2h. 5m. M.
	6		☽ in Apogee.
16			Mercury R. A. 14h. 49m. dec. 19. 41. S.
—			Venus R. A. 16h. 27m. dec. 25. 49. S.
—			Mars R. A. 11h. 10m. dec. 6. 45. N.
—			Vesta R. A. 9h. 5m. dec. 17. 41. N.
—			Juno R. A. 16h. 44m. dec. 11. 10. S.
—			Pallas R. A. 6h. 3m. dec. 19. 51. S.
—			Ceres R. A. 8h. 15m. dec. 23. 15. N.
—			Jupiter R. A. 19h. 5m. dec. 23. 0. S.
—			Saturn R. A. 18h. 38m. dec. 22. 49. S.
—			Georg. R. A. 23h. 44m. dec. 2. 35. S.
—			Mercury passes mer. 1h. 11m.
—			Venus passes mer. 2h. 49m.
—			Mars passes mer. 21h. 30m.
—			Jupiter passes mer. 5h. 26m.
—			Saturn passes mer. 4h. 59m.
—			Georg. passes mer. 10h. 4m.
	3	34	♀ greatest Hel. Lat. S.
	15	39	Her. in conj. with the ☽ diff. of dec. 6. 3. S.
17			Occul 45 Piscium, im. 9h. 47m. em. 10h. 44m.
18	7	42	♃'s first satt. will em.
19	11	12	Ecliptic oppo. or ○ full moon
20			Clock after the sun, 15m. 5s.
—			☽ rises 4h. 51m. A.
—			☽ passes mer. 0h. 1m. M.
—			☽ sets 7h. 49m. M.
	2	48	☿ stationary
22	1	51	♀ in conj. with ☽ diff. of dec. 15. 14. N.
22	9	2	♃'s third satt. will em.
23			Occul *B* in Tauri, im. 16h. 42m. em. 17h. 56m.
25			Clock after the sun, 15m. 48s.
—			☽ rises, 9h. 2m. A.
—			☽ passes mer. 4h. 24m. M.
—			☽ sets, 0h. 47m. A.
26			Occul d^2 Cancri, im. 9h. 45m. em. 10h. 34m.
27	0	41	☽ in □ or last quarter
27	2	6	Ceres in □ with the ☉
			Occul ξ Leonis, im. 15h. 2m. em. 15h. 48m.
31	4		☽ in Perigee
31	6	46	☿ in conj. with the ☉

J. LEWTHWAITE, Rotherhithe.

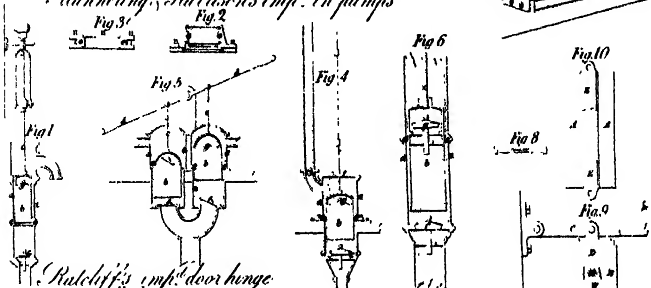
Marton's blooming iron



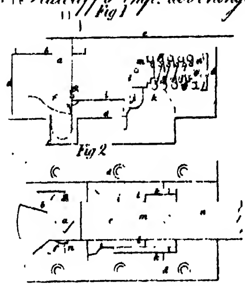
Davis' manufacture of sealing wax



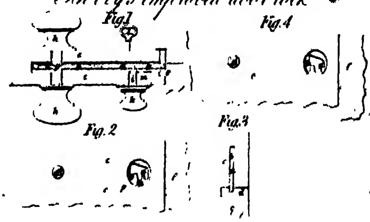
Manning & Harrison's imp^ts in pumps



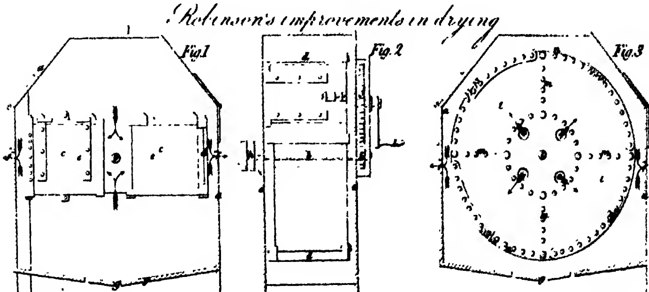
Ratcliff's imp^d door hinge



Berry's improved door lock



Robinson's improvements in drying



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Henshall's imp^ts in manufacturing carpets

Fig. 1

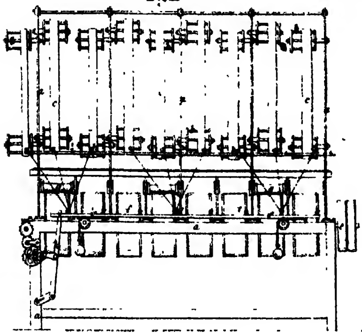


Fig. 2

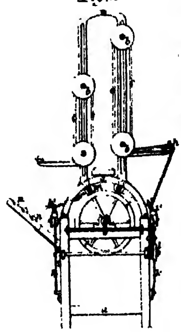


Fig. 6

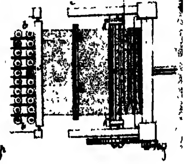


Fig. 7

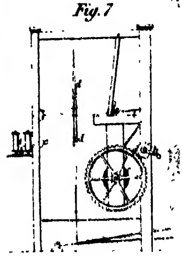


Fig. 3

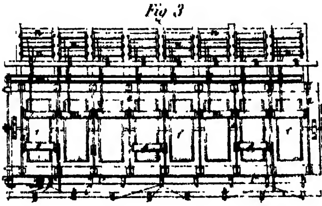


Fig. 5

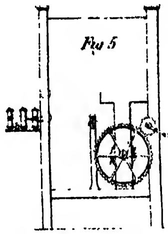
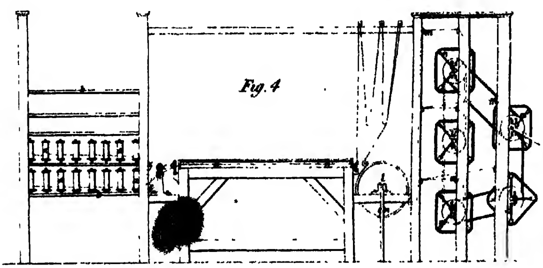


Fig. 4



Rodway's horse sh

Fig 1

Fig 2

Haley's lifting jac

Fig. 3

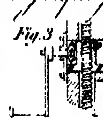


Fig 2

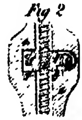
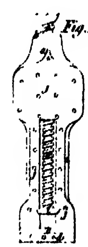


Fig. 1



Bocius' gas burner

Fig. 1

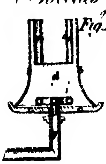


Fig. 3

Fig. 2

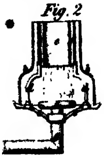
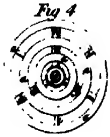


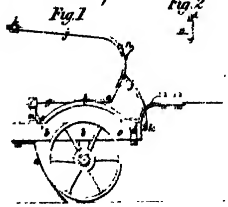
Fig 4



Grant's imp^d horse rake

Fig. 1

Fig. 2



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No. CXXXI.

Recent Patents.

To THOMAS KNOWLES, *of Manchester, in the county of Lancaster, cotton spinner, for certain improvements in machinery or apparatus used in the preparation of cotton and other fibrous substances.*—[Sealed 1st August, 1839.]

THESE improvements in machinery or apparatus, used in the preparation of cotton and other fibrous substances, consist, firstly, in the application of a certain novel arrangement of mechanism to carding, drawing, and roving machines, used or employed in the preparation of cotton and other fibrous substances, for spinning; and secondly, in the application of a single twisting tube or guide, to drawing and roving frames, which may be used in combination with the aforesaid improvements, for the purpose of imparting sufficient tenacity to the sliver before winding it upon a bobbin, to enable it to be unwound without injury, in the subsequent process.

The principal feature of novelty, in the first part of the improvements, is effected by passing the sliver, as it proceeds from the doffing end of the carding-engine, along

and around a moveable expanding guider, which prevents any unequal tension or stretching of the sliver, as it is conducted to the bobbin, at whatever part of the bobbin the sliver may be winding on.

In Plate IX., fig. 1, is a side elevation, representing the first part of the improvements, as applied to a carding-engine, for carding cotton; fig. 2, is a plan or horizontal view, as seen from above; and fig. 3, is a vertical section, taken through the same

It will be observed, that the improvements are only applicable to those machines in which the filaments, slivers, or slubbings of cotton, &c., are wound upon bobbins, instead of being placed in cans.

Part of the cast-iron framing, of an ordinary carding-engine, is shewn at *a, a,* which is the doffing end; *b,* is the filament of cotton, proceeding through the trumpet or cone *c,* to the ordinary drawing-box *d, d*; from thence the cotton proceeds, in a band or sliver, along the jointed guider d^1, d^1, and around the central projecting pin *e,* which is placed at the middle of the guider, upon an ordinary swivel or rule-joint. The sliver of cotton thus proceeds through the guide *f, f,* and under the pressing-roller *g, g,* whence it is coiled or wound upon the bobbin *h, h,* as it revolves upon the drum *i, i.*

Motion may be given to the apparatus, from any convenient part of the carding-engine or other machine, to which it is applicable.

The shaft *l,* being a part of the carding-engine, is, in this instance, used for giving motion to the drawing-rollers: a small pulley *m,* is fixed upon it, and a strap being passed round this pulley, and a larger pulley *n,* fixed on the axis of the drum or bed-roller *i, i,* this drum is caused to revolve, and, by friction of contact, enables the bobbin to wind on the sliver. At the same time, by means of the mitre-wheels *o, o,* and shaft *v,* motion is communicated to the mangle-pinion *p,* and mangle-rack *q,* in order to traverse the guide or arm *f,* (which is fastened to the rack *q,*) from end to end of the bobbin, as the sliver is wound up.

It must be here observed, that as the bobbin winds up

each succeeding layer of the sliver, its diameter increases, and, consequently, its speed decreases; and the guide or arm *f*, always traversing at the same speed, the coils of the sliver, which, in the first layer, are wound upon the bobbin, side by side, are, in each succeeding layer, wound on further and further apart, and make a smaller and smaller portion of a whole revolution, straight round the bobbin, at each extremity of the traverse.

It must also be observed, that the traverse of the arm or guide *f*, is made about an inch shorter, at each end, than the distance between the bobbin-heads; and as the diameter of bobbin increases, by the continuous winding-on of the sliver, the first or under layers will expand, by the pressure of the upper layers. By these arrangements, the bobbin may be filled to twice the size of the bobbin-heads, and the mass of sliver, which is above the bobbin-heads, will have conical ends, without the use of any other shortening motion whatever; and the coils will not slip off at the ends.

The distance from the unvarying point, where the sliver is delivered from the carding-engine to the varying points on the bobbin, where it is wound up, gradually increases, as the point of winding-up is further from the middle of the bobbin, and nearer its ends. The sliver, therefore, having to extend through this increasing distance, would manifestly be stretched more and more as the operation proceeded, unless it were allowed to be inconveniently slack, when the distance was short. The expanding guider, d^1, d^1, is therefore applied to remedy this slackness or stretching. One of its ends is fixed on a pivot *y*, (see fig. 3,) just under the point at which the sliver is delivered; the other end is fixed upon a pivot, at the guiding end of the guide or arm *f*; and at about its middle is a rule-joint, on which a pin *e*, is fixed. The expanding guider d^1, d^1, thus reaches across the varying distance, and by means of its pivots and joint, when that distance is short, it is considerably bent, and as that distance increases, it is gradually straightened.

By means of the pin *e*, the sliver is made to follow the direction of this expanding guider, and when the distance is short, the otherwise inconvenient slackness of the sliver

is taken away by its bent form, and as the distance increases, its straightening prevents any stretching of the sliver.

Fig. 4, represents a front, and fig. 5, a side view of the improvements, as applied to a drawing-machine.—*a, a*, being the framing of the apparatus; *b*, the sliver of cotton, proceeding through the trumpet or cone *c*, to the front or delivering-rollers *d, d*; from thence the sliver proceeds, exactly as above described, along the jointed guider d^1, d^1, and around its central projecting pin *e*. It will be seen, in this apparatus, that the expanding guider is placed vertically, instead of horizontally, as in the one previously described.

The reciprocating twisting motion may be applied in many ways, but it is shewn in the drawings as communicated by the crank or excentric *p*, fixed on the end of the shaft *l*, working the twisting cord or band *q, q*, backwards and forwards. This band, its ends being attached to two convenient parts of the framing, passes round the twisting tube *w*, and gives to it a similar motion. *r, r*, are pullies, to guide the band *q*, to and from the tube, one of them being fixed on the bow-spring *s*, which gives elasticity to the band. *t, t*, is a small inclined plane, for the purpose of throwing off from the sliver any oil that may escape from the twisting tube in working.

It is necessary to have the aperture in the upper part of the twisting tube, oblong, so that the sliver will not slip round within it.

An important feature in this new combination of machinery is, that it is applicable to the drawing-frame now in use, without any alteration or derangement of its parts, except such as shewn above.

From the expanding guider d^1, d^1, the sliver proceeds through the tube *w*, fixed in the guide or arm *f*, and under the pressing-roller *g*, whence it is wound upon the bobbin *h*, revolving upon the drum *i, i*, as in the carding-engine; the only important difference between the apparatus, as applied to a carding-engine and the other machines, being the addition, in the latter, of the tube *w*, through which the sliver is passed, to give it sufficient tenacity to be unwound from the bobbin in the subsequent process, without injury.

Motion is given to this new combination of machinery, in the drawing-frame, as follows:—

A small pulley *m*, being fixed upon the shaft *l*, which is a part of the drawing-frame now in use, a strap is passed round it, and a larger pulley *n*, on the axis of the drum *i*, *i*. The traverse and winding-up of the sliver are effected, as above described, in the carding-engine.

The doffing of a full bobbin, from this improved apparatus, is effected by merely releasing the catch *z*, from the side of the frame-work, and removing the full bobbin, while the end of the sliver may be immediately passed round the empty bobbin, which has been placed in the machine, without otherwise disturbing the machinery, or stopping the operation of any of the working parts.

But, as the mode of doffing is an important part of the invention, when applied to drawing and roving-frames, in consequence of their running at a very great speed, a more particular description may be necessary:—

The dotted lines, in fig. 5, shew the position of some parts of the machinery, during this process. When the bobbin is full, as at *h*, the catch *z*, being raised, allows the front part 1, of the frame, to be turned upon its centre, at 2, until its tail-piece 3, coming in contact with the underside of the stationary frame-work, stops it. At the same time, the full bobbin, following the frame *h*, rolls along the surface of the drum *i*, and continues to wind on the sliver, until it is broken off. The empty bobbin 5, is now dropped into its place, where it is supported by a short projecting piece of the stationary frame-work, from which the full bobbin becomes free, in consequence of its increased diameter. As the full bobbin continues to wind on, till the sliver is broken off, no particular hurry is necessary, and the attendant may deliberately turn the broken end round the empty bobbin, which then begins to wind on. The full bobbin is now to be removed, and the frame *h*, raised to its former place, where it is again held by the catch *z*, until the succeeding doffing.—*Inrolled in the Rolls Chapel Office, February*, 1840.]

Specification drawn by Messrs. Newton and Son.

To Godfrey Anthony Ermen, *of Manchester, in the county of Lancaster, cotton spinner, for certain improvements in machinery or apparatus for spinning, doubling, or twisting cotton, flax, wool, silk, or other fibrous materials; parts of which improvements are applicable to machinery in general.*—[Sealed 2nd December, 1839.]

These improvements have reference to that kind of machinery, wherein the operations of spinning, doubling, and twisting, are performed by a spindle and flyer.

The invention consists, Firstly.—In the application of the conjoined action of centripetal and centrifugal forces to the motion of the revolving spindle, subjecting such spindle, or spindle and tube fixed thereon, or spindle and bobbin fixed thereon, upon which the thread is to be spun, doubled, or twisted, to their united influence, by not confining it, laterally, either by a fixed bearing, or an elastic bearing, or any bearing whatsoever, that may cause the revolving spindle to rebound, and thereby impart a vibratory motion.

Secondly.—In the application of an independent, expansive, swivel bolster and moveable cup, placed between the bottom and the top of the spindle, which apparatus shall yield to any lateral pressure of the revolving spindle, tube, or bobbin, and shall prevent the spindle from rebounding, and, at the same time, cause the required retardation or drag upon the spindle, which drag is necessary for the taking-up of the thread, whilst it is spun, doubled, or twisted.

Thirdly.—In spinning what are commonly called "pin-cops" upon a tube, or on the bare spindle. The advantage thus obtained is, that a flyer can be employed, with arms much shorter than those in ordinary use, which will, consequently, allow it to run at a much higher velocity. This is effected by simply reversing the manner of spinning or forming the cop, that is, by forming it with its shorter cone or taper, at the upper end of the spindle, when the length of the flyer will only be required to be the same as the longest cone or taper of the cop.

Fourthly.—In the novel and peculiar arrangement of the mechanism or apparatus, for the purpose of lowering the bolster or drag-rail, as the thread or yarn increases in diameter upon the bobbin.

Fifthly.—In the application of a morticed swivel lever to spinning, doubling, or twisting machinery, for the purpose of more easily changing the "change-wheels," for regulating the draft and twist; and,—

Lastly.—In converting the ordinary cone-drum (which is usually driven by a strap) into a geared cone, by forming rings of teeth upon its surface. In these teeth, a single driving pinion, capable of being slidden from end to end of the toothed cone, is made to gear; and thus, by the lateral movement of this pinion, any required speed may be obtained.

Also, in the general arrangement of apparatus, in immediate connection with the cone-drum, for the purpose of regulating the various motions of the spindles or bobbins, in roving, slubbing, or preparing machinery.

In Plate X., figs. 1, 2, and 3, exhibit the first part of the improvements, shewing the spindle and flyer, with the independent expansive swivel-bolster and loose bearing, in its relative situation.—Fig. 1, is an elevation of the spindle and flyer complete, with the top-rail, bolster-rail, and step-rail, in section; fig. 2, is a plan of the ball and socket, forming the bolster; and fig. 3, a third portion of the ball detached.

The spindle *a, a,* with its bobbin *b, b,* and flyer *c, c,* is supported in the step *d,* below, which is fixed in the bottom lifting or copping-rail *e, e,* and passes independently through the top-rail *f*, f*,* and also through the bolster or drag-rail *f, f.*

This elastic bolster or bearing is of a novel and peculiar construction, and consists of a loose socket or cap *g, g,* resting on its rail, but capable of lateral motion; in this socket is placed the small turned ball *h, h,* composed of three pieces, through the centre of which the spindle is passed;—the whole is enclosed by an adjustable loose-weighted top or cover *i, i.*

The effect of this peculiar combination or arrangement of apparatus (forming an expansive and independent bolster) will be, that as the spindle revolves, at a very high velocity, it is thus subjected to the united impulse of the centrifugal and centripetal forces, and caused to revolve centrally and perpendicularly to the plane of the flyer; whilst, at the same time, any requisite amount of drag or resistance may be given, as the cop or bobbin is filled, by lowering the drag or bolster-rail *f, f,* and thus allowing the ball to act against the conical sides of the spindle, as seen at *k, k.*

The ball segments, forming an universal joint within the cup, and the socket resting loose on the even drag-rail, will yield to any lateral push of the spindle. The three segments enclose the spindle, and being made to press against it, friction is thereby caused, which gives the desired retardation to the spindle.

As the thread on the spindle, tube, or bobbin, increases in diameter, more friction is required; this is obtained by increasing the diameter of that part of the spindle where the segmental ball and socket act, to a gradual tapering downwards, for about four inches, at the inclination of about one thirty-second part of an inch to the inch in length. By lowering the drag-rail, with its segmental balls and sockets, on to the thicker part of this taper or cone, friction is of course increased, and, by adjusting the lowering of this rail, proportional to the time in which the bobbin or spindle fills, any desired retardation or drag upon the spindle may be obtained.

Fig. 4, represents the improved spindle and flyer, for spinning pin-cops, in the manner before explained, that is, with the cop spun or formed in the reverse position. *a, a,* represents the spindle; *b, b,* the short-armed flyer; and *c, c,* the cop, which is spun or wound on from the top; the arms of the flyer are therefore required to be the exact length of the longest taper of the cop, and no more; this will allow of the flyer running at a very high velocity.

Fig. 5, represents an elevation of a spinning-frame, called a throstle, with the improvements applied thereto; and fig. 6, is an end view of the same.

These figures represent, more particularly, the third and fourth features of the improvements. *a, a, a,* are the spindles; *b, b, b,* the bobbins; *c, c, c,* the flyers; and *d, d,* the lifting or copping-rail below. The drag-rail, supporting the loose bolsters, is seen at *f, f,* and the bolsters *g, g,* are constructed as just explained, with reference to figs. 1, 2, and 3.

Now, in order to impart any required degree of drag or resistance to the spindle, while running at its full velocity, the bolster-rail *f, f,* is lowered, with its loose bolsters, on the conical part *k, k,* of the spindle, as the bobbin fills, by means of the mangle-wheel and pinion *l, m,* actuated by the worms and wheels *n, n, o, o,* which will be readily understood by the practical spinner.

The application of a morticed swivel-lever to spinning machinery, is also shewn in these figures, and to doubling machinery in fig. 7. *p, p,* is a morticed vibrating lever, for the purpose of carrying the ordinary change-wheels *q, q,* to work the twist and draft; and it will be seen, that by the employment of this lever, as the carrier for the change-wheels, it being able to turn upon a centre, the change may be more readily accomplished.

Fig. 8, represents an elevation of an arrangement of apparatus, for the purpose of regulating the various motions of the bobbins or spindles in roving, slubbing, or preparing machinery; it consists principally in the substitution of a geared cone *a, a,* in place of the ordinary strap-cone, used in spinning machinery.

Upon the drawing-shaft *b, b,* a fast pinion *c,* is mounted, which drives, by means of the carriers *d, d,* the spur-wheel *e,* in gear with the toothed periphery of the cone *a, a.* This cone *a, a,* communicates motion to the bobbins, by means of the mangle-pinion and wheel *f, f,* and spur-wheel *g,* which is fast upon its boss.

The lifting or cop-motion is communicated to the machine, by means of the wheel *h,* also driven by the cone *a,* upon the shaft *i, i,* and, by means of the jointed-shaft *j,* to the mangle-pinion *k,* and wheel *l.*

It will be seen, that at every revolution of the mangle-

wheel *l*, a pin *m*, comes in contact with the catch-lever *n*, (see fig. 9,) and disengages it from the rack *o*, which has teeth formed alternately on each side. Upon the rack *o*, being liberated from the lever *n*, the weighted cord *p*, brings it down one tooth, and moves the wheel *e*, which is attached, into gear with the next ring of teeth on the cone *a*; and so on, at every rise or fall of the bobbin, thus ensuring the regularity of its motion.

The patentee claims, firstly, the application of a moveable independent bolster, placed between the top and bottom of the spindle, that as the spindle revolves therein, the conjoined action of the centrifugal and centripetal forces, in combination with such expansive bolster, shall cause such spindle to revolve centrally and perpendicularly to the plane of the flyer; secondly, the mode of spinning the cop, in a reversed position, by means of a short-armed flyer, the length required being only that of the longest taper of the cop; thirdly, the peculiar arrangement of mechanism, for lowering the bolster or drag-rail; fourthly, the application to spinning, doubling, or twisting machinery, of the mortised swivel-lever, for carrying the change-wheels; and lastly, the peculiar arrangement of mechanism or apparatus, for the purpose of regulating the motions of the bobbins or spindles, in roving, slubbing, and preparing machinery, and particularly the substitution of a cone, composed of toothed gear, and worked by a spur-wheel, instead of having a plain surface, to be worked by a strap.—This part of the improvements is also applicable to machinery in general.—[*Inrolled in the Rolls Chapel Office, June*, 1840.]

Specification drawn by Messrs. Newton and Son.

To JAMES CAPPLE MILLER, *of Manchester, in the county of Lancaster, Gent., for certain improvements in printing calicoes, muslins, and other fabrics.*—[Sealed 15th August, 1839.]

THESE improvements, in printing calicoes, muslins, and other fabrics, consist in a novel arrangement and construction of

mechanism or apparatus, whereby the pattern or design may be printed upon the goods or fabrics, by the agency of machinery, worked by steam or other adequate power.

The peculiar department of printing calicoes, muslins, &c., to which these improvements are more particularly applicable, is that process usually denominated block printing, which is ordinarily performed by manual labour; the design or pattern to be printed, being first traced on the surface of the blocks, and small portions of a single color impressed upon the cloth, by the hands of the workman, the intervening and finishing colors being separately printed at successive intervals.

The advantages attainable by this invention are, firstly, the capability of printing two, three, four, or more colors, at one operation; and secondly, completing the printed pattern upon the whole width of the piece of goods, or upon two or more pieces, side by side, in the same machine; and by having another table, and set of impression boxes and color boxes, the same movements may be applied, so that the carriage, in retiring, may print two or more pieces, and in advancing, print also two more.

In Plate IX., are several views of the improved machine, calculated to print two pieces, or two different patterns, on the same block, of calico, muslin, or other fabric, side by side, (or four pieces, the carriage printing both ways,) the intended pattern or device, to be printed, consisting of four colors, to be printed from blocks.

Fig. 1, represents a side elevation, and fig. 2, a front view of the improved printing machine; fig. 3, represents a transverse section, taken through about the middle of the machine.

The side or main framing of the printing machine, is shewn at *a, a,* supporting the color-boxes *b, b, b,* with their "doctors;" the furnishing tables or beds *c, c, c,* (which are a substitute for the sieve in ordinary block printing); the printing table *d, d*; and the feeding, drying, and delivering-rollers *f, f, g, g, h, h.*

The machine is also provided with a carriage *i, i,* for the printing blocks *j, j, j, j.* This carriage *i, i,* travels in and

out, at suitable intervals, upon rails *k*, *k*, attached to the main framing

The operation of the machine is effected, by passing a driving-strap *l*, connected, by shafting, to the steam-engine, or any other adequate power, round the driving-pulley *m*, fixed at the extremity of the main driving-shaft *n*, *n*. At the other end of the shaft *n*, is keyed the bevil-pinion *o*, gearing, at suitable intervals, (hereafter explained,) with the bevil-wheel *p*, which is mounted upon one end of the cross-shaft *q*; at about the middle of which, the mitre-wheels *r*, *r*, driving the upright shaft *s*, *s*, and mitre-wheels *t*, *t*, above, actuate, by means of the spur-pinions *u*, *u*, the feeding-rollers *f*, *f*, and thus draw the pieces of goods into the machine.

Simultaneously with the progress of the cloth, the mitre-wheels *v*, *v*, at the other end of the cross-shaft *q*, drive the furnishing-rollers *w*, *w*, *w*, by means of the spur-gearing *x*, *x*, *x*. The furnishing-rollers, revolving in their respective color-boxes, spread or supply the colors upon the travelling endless blankets *y*, *y*, *y*, which pass around the top roller, and the furnishing-tables or beds *c*, *c*, *c*, in order to supply the colors to the surfaces of the printing blocks *j*, *j*, *j*.

It may be here remarked, that either the beds *c*, or the backs of the printing blocks, may be made slightly elastic, to insure the perfect taking-up of the color by the blocks.

Supposing now the carriage *i*, *i*, to be run out upon its railways, at the farthest point from the beds *c*, *c*, it is drawn inwards towards the furnishing-beds *c*, *c*, by means of the spur-wheel *z*, upon the driving-shaft *n*, taking into a small pinion 1, (shewn by dots in fig. 1,) upon the shaft 2. On the end of this shaft is also keyed the mangle-pinion 3, gearing in the mangle-wheel 4, which is keyed upon the end of the shaft 5. This shaft drives the spur-wheel 6, in gear with the pinion 7, fast upon the shaft 8,—see fig. 3.

Upon either end of the shaft 5, is a rack-pinion 9, taking into the horizontal rack 10, fast on the carriage-frame *i*, *i*, and thus the blocks *j*, *j*, *j*, are presented to the furnishing-blankets *y*, *y*, *y*, and take a supply of color ready for print-

ing. The travelling carriage and blocks now retire, by the agency of the mangle-wheel and pinion 3, and 4, the pinion being fast upon the end of the shaft 2, and the wheel being fast upon the other shaft 5, in a line with the shaft 2. At this time, another operation of the machine takes place:—

Upon the reverse end of the shaft 5, is a pinion 11, gearing with the spur-wheel 12; and by means of the spur-gearing 6, and 13, and counter-shaft 14, the pinion 15, drives the spur-wheel 16, which corresponds to the wheel 12, on the other side of the machine. To one of the arms of these spur-wheels are attached, by bolts, two quadrant levers 17, 17; and as these wheels revolve, by means of the gearing just described, the levers 17, 17, draw down the chains 18, 18, actuate the levers 19, and 20, and thus elevate the whole series of printing blocks in the parallel grooves 21, 21, at the same time pressing or closing them into one mass or block, by expanding the springs 22, 22, and at the next advance of the carriage caused, at the proper interval, by the agency of the mangle-wheel, the blocks are made to impress the pattern upon the surface of the goods, at cnce, in four or more different colors, and in one, two, or more widths of cloth, at one operation.

The cloth is now drawn forward, for the space of the exact width of one of the blocks or sketch of the design, by means of the spur-wheels and pinions 23, 23, and passed around heated cylinders *g*, *g*, if necessary, and between the delivering-rollers, out of the machine. These operations are to be repeated, by the continuous rotation of the main driving-shaft, until the printing is completed, the colors making a single advance upon the pattern at every presentation of the blocks, until the whole number of blocks have been presented to the same space or portion of the goods successively.

It will be observed, that steam-pipes 24, are to be in connection with the printing table and drying cylinders, in order to supply a degree of steam-heat during the operation, which may be regulated at pleasure.

To give suitable intervals of rest and motion to the various parts of the driving gear, an ordinary clutch-box 25,

shewn in the drawing fig. 1, and regulated by suitable stops, fixed to the travelling carriage, is used for throwing the wheel *p*, in and out of gear with the pinion *o*;—this is to prevent cloth or colors from being dragged upon the blocks or cloth.

The patentee claims the novel arrangement and construction of mechanism or apparatus, for printing calicoes, muslins, and other fabrics, as exhibited in the drawings, and herein particularly set forth, without being confined to the precise form or dimensions thereof.—[*Inrolled in the Rolls Chapel Office, February*, 1840.]

Specification drawn by Messrs. Newton and Son.

To GEORGE CLARKE, *of Manchester, in the county of Lancaster, manufacturer, for certain improvements in the construction of looms for weaving.*—[Sealed 23rd January, 1840.]

THE object of these improvements, is to obtain, by more efficient mechanism than has hitherto been employed, a variety of patterns or devices, in the fabrics woven in looms.

The invention may be said to consist, firstly, in a peculiar and novel construction and arrangement of mechanism, forming an endless and flexible rack of teeth or tappets, to be employed in looms, in place of the ordinary revolving tappet-plates or wheels; and secondly, in the application and use of such apparatus, in combination with certain other arrangements of mechanism.

The variety of patterns is obtained by a greater extent of operations being afforded to such working parts of the loom as are required to shift the healds or shafts, for shedding the warps, in order to work or produce the pattern or figure, without the assistance of the Jacquard machine, or any similar figuring apparatus.

This improved mechanism, which may be readily applied to any fancy or figure loom, is so constructed, that a great variety of shifts, changes, or "numbers to the

round," may be readily accomplished, before it becomes necessary to repeat the order of shedding or recommencing the same pattern or figure, by renewing " the round " (as it is termed by the weaver) and any required alteration in the figure to be produced, may be made with facility and speed; that is, the " reading on" of the tappets or teeth, may be varied to a much greater extent, than can be commonly done by the ordinary tappet wheels.

The patentee remarks, that he is aware of endless chains or ladders having been heretofore employed, for the purpose of changing or shedding the warps, but they are constructed so as to carry rollers, revolving on certain bars, as their axles, and adjustable longitudinally in their situation thereon; which rollers act upon certain vertical levers, and thereby effect the shedding of the warps.

This improved figuring apparatus, or flexible tappet rack, however, is formed by simply providing a given number of bars or ribs of a certain length, according to the number of shafts or healds employed in the loom, or the width they occupy, and placing them at certain distances apart. Upon these bars are mounted, in any convenient manner, teeth, tappets, or studs, capable of being readily adjusted, as the different patterns or devices to be woven may require; the whole are formed into an endless flexible rack or band of tappets, by side bands, belts, or chains, hereafter more particularly detailed.

In order that this invention may be more perfectly understood, two modes of applying the improvements are shewn in the drawings.

Plate X., fig. 1, is a front view of a power loom, representing the application of one description or arrangement of the improved endless belt or chain of tappets to a loom for weaving figured fustians; and fig. 2, is an end elevation of the same. The ordinary framing or loom-sides, are shewn at A, A, supporting the warp roller B, from whence the warp threads C, proceed through the heddles D, also through the reed E, of the vibrating lathe F, over the breast beam G, to the cloth or work roller H, as usual. The ordinary crank shaft of the loom is shewn at I, from

which motion is communicated to the improved mechanism, attached to the side of the loom, and supported in a separate framing *a, a,* as follows:—

Upon the end of the crank shaft I, is fixed the crank plate *b,* revolving in the ordinary direction, and actuating the link *c,* attached at its upper end, by a pin, to the crank plate, and at its lower end to the lever *d.* This lever *d,* vibrates upon its fulcrum at *e,* and carries, at one extremity, a draw catch *f.* This apparatus is seen detached from the loom in fig. 3, and is designed for the purpose of actuating the catch-wheel *g,* one tooth at every revolution of the crank shaft; the catch-wheel *g,* is mounted upon the shaft *h,* (see detached fig. 4,) and upon this shaft, the notched guide-wheels *i, i, i,* are also fixed; around and taking into which, the flexible rack or belt of tappets *k, k, k,* passes; this tappet rack is conducted over similar notched or guide wheels *l, l,* supported at the top by the frame *a, a,* and around a tension pulley *m,* placed about midway in the frame, for the purpose of assisting the drag or weight of the tappet-rack.

It will now be seen, that as the travelling tappet-rack proceeds in the direction of the arrows, that the teeth, studs, or tappets *, *, *, of which it is partly composed, (and which it will be evident to the practical weaver, are so placed, arranged, or "read on," according to the pattern or device to be woven,) will strike against the heads of the heddle levers *n, n, n,* with one of which, each heddle D, is in connection. These levers *n, n, n,* are all suspended, and vibrate upon the shaft or fulcrum *o,* and are each connected by means of links or wires *p, p,* to the hooked lifters *q, q, q,* for the purpose of throwing the lifters into the position, where they may be acted upon by the rising cross-bar *r.*

The requisite action of the rising and falling bars *r, r*,* is effected, simultaneously, with the progressive motion of the tappet-rack *k, k,* also by means of the link *o,* vibrating the lever *d*; on the other extremity of which, the connecting lever *s,* is attached, which is jointed, at its lower end, to the crank *t,* fixed upon the roller *u,* around which a

strap or belt *v, v*, passes, and over a similar roller *u*, at top. To this strap *v*, the bars *r, r**, are fixed; and it will be seen, that as the strap traverses, by means of the vibrating action imparted to the crank *b*, the requisite alternate raising and depressing of these bars is accomplished; they are kept in parallel positions, by traversing up and down in mortices, in the frame *a, a*. The heddle levers *n, n*, are also brought into the position, where they may be acted upon by the falling bar *r**, by means of the weight *n**, with which each lever is furnished.

The hooked lifters *q, q*, are each separately connected by a pin 1, to vibrating treadles *w, w*, working on their fulcrum shaft *x*, fixed to the frame *a*. These treadles *w, w*, are connected, at their extremities, by means of the wires *y, y, y*, to the ordinary top and bottom jacks *z, z, z*, and, by the customary stringing, to the heddles D, and thus, as the tappet-belt or rack revolves, will shed the warp, and consequently work the pattern.

Fig. 5, represents a portion of the tappet-rack detached, upon a larger scale, and fig. 6, the several pieces of which the improved endless tappet-rack is composed. 1, shews a front view, and 2, a back view, of the perforated bar, for receiving the studs, teeth, or tappets 2;—3, the nut, by which the tappets are held, and adjustable in the bar. A number of these bars, placed at suitable distances apart, and furnished with the necessary number of holes for "reading on" the tappet-studs, as the pattern requires, are formed into an endless rack, belt, or chain, by being screwed or otherwise fixed upon a band, composed of canvass, tape, and leather, cemented together by means of a solution of caoutchouc.

At fig. 7, a modification of the improvements, and the mode of applying the same to figure or fancy looms, is shewn. The drawing represents a partial sectional view of the figuring apparatus, attached to an ordinary loom side. An endless belt, or rack of teeth, studs, or tappets *a, a, a*, passes around, and is progressively actuated by the grooved rollers *b, b, b*, supported in the framing *c, c, c*, attached to the side of the loom.

*The moveable tappets, studs, or teeth *a, a, a,* are suitably arranged upon their bars or rails, (as in the former instance,) to work the pattern or device required, and are alternately caused to raise or depress the treadles *d, d,* successively, by acting upon the rollers *e, e,* with which they are provided. Thus the simple action of these risers and fallers is transmitted directly to the heddles, by means of the connecting wire *f, f,* actuating the top jacks *g,* and bottom jacks *h,* which are connected by stringing to the harness, as usual, the whole being put in motion by means of the spur-pinion *i,* upon the end of the ordinary crank-shaft, driving the spur-wheels *k,* and *l,* upon the axles of the grooved rollers *b, b.*

Fig. 8, represents the detached pieces of which this endless belt or rack of tappets is composed. 1, is the foundation-bar or rail, upon which the moveable tappets, studs, or teeth 2, are slidden longitudinally; and 3, represents blanks or pieces, to slide over the bar, where the teeth, studs, or tappets, are not required by the pattern.

These bars or rails of tappets are connected or linked together, at suitable distances, into an endless length or chain, by being confined or strung together by the chain 4, at each side, or by any other suitable means; thus it will be seen, that these studs or teeth, and their intervening blanks or spaces, may be so arranged, upon any bar, or system of bars, that the necessary raising and depressing of the treadles *d, d,* may be varied or adjusted, to suit the pattern or device required to be woven; which arrangement, adjustment, or "reading on" of the tappets or teeth, in both the above descriptions of racks, belts, or chains, will be readily under stood, and applied by the practical weaver.—[*Inrolled in the Petty Bag Office, July,* 1840.]

Specification drawn by Messrs. Newton and Son.

To Peter Fairbairn, *of Leeds, in the county of York, engineer, for certain improvements in machinery or apparatus for heckling, combing, preparing, or dressing hemp, flax, and such other textile or fibrous materials,—being a communication.*—[Sealed 13th July, 1840.]

These improvements in machinery, for heckling, combing, preparing, and dressing hemp, &c., consist in the novel construction and arrangement of certain apparatus called heckles or heckle-bars, in conjunction with other mechanical agents; by which construction and arrangement, (constituting a machine,) the said heckles are made to operate upon the fibres of hemp, flax, and other kinds of textile materials, with better effect than has been obtained by any of the machinery heretofore employed for the same purpose.

In the accompanying drawing, this improved machine is represented in different figures, which shew the forms and positions of the several parts, and their modes of operating.

In Plate XI., fig. 1, is an elevation of the complete machine, as it would appear when viewed on one side; fig. 2, is a similar elevation, taken in front; fig. 3, is a longitudinal section, through about the middle of the machine; and fig. 4, represents a section of the machine, taken horizontally through the frame, the casing, and the drum, about the level of the axle. The two last-mentioned figures exhibit the internal arrangement of the springs connected to the heckle-bars, and to the sliding-guards or strippers.

Fig. 5, represents one of the heckle-bars, detached from the machine. It is formed of a hollow cylinder or tube of brass, having a row of small holes perforated along it, into which the pins or heckle-points are to be inserted; these pins are made fast in the bar, by filling up the interior of the tube with melted cement. Cap-pieces are then affixed to the ends of the tube, having studs or pivots, by which the heckle-bar is to be held, when mounted upon the drum.

Fig. 6, represents one of the guards or sliding-strippers,

formed of a narrow piece of wood; one of which strippers is to be placed between every two heckle-bars, round the periphery of the drum, as shewn in fig. 3.

The large cylinder or drum, which carries the heckle-bars and guides or strippers, is formed of two wooden circular ends *a, a,* connected and held fast by an iron axle *b*; the periphery of the drum being formed by a thin plate of zinc *c, c, c,* (seen best in fig. 3,) which is bent round, and attached, at its edges, to the circular wooden ends. Upon the outer edge of each wooden end of the drum, a series of segmental pieces, forming a rim or flange of iron *d, d, d,* are affixed, having a circle of small round holes, perforated through the flange, in which the pivots of the heckle-bars *e,* are to be inserted, as seen in fig. 4; and there are also radial slots, cut through these rims or flanges, for the ends of the sliding-guard or strippers *h,* to work in, as shewn in the sections, figs. 3 and 4.

A small cord is attached to the heckle-bar *e,* near each of its ends, and passed over it on one side. These cords are carried through holes in the periphery of the drum *c, c,* and connected to helical springs *f, f,* affixed to the blocks *g,* within. Similar cords are also attached to the guards or strippers *h, h,* near each of their ends; which cords are in like manner passed through small holes in the periphery of the drum *c, c, c,* and connected to springs *i, i,* affixed to the blocks *g, g.*

The object to be obtained from this mode of constructing and mounting the heckle-bars *e,* and attaching cords and springs *f,* to them, is, that the heckle-bars may not be rigidly fixed to the drum, but possess a slight degree of elasticity, in order, that when the points of the heckles meet with obstruction, in passing through the strick of flax, the bar may be enabled to give way, by turning upon its pivots; by this means the points of the heckles will be drawn out of the flax, instead of being forced through the strick, to the manifest danger of breaking the fibres, the springs and cords being the agents by which the heckles are brought back again to their proper positions, which are determined by a small stud, on the side of the heckle-bar, coming against a stop fixed in the drum.

The guards or strippers *h, h*, are for the two-fold purpose of regulating the depth to which the points of the heckles shall be allowed to penetrate into the strick of flax, whilst under the operation of heckling, and for stripping off or removing the tow from the points of the heckles, at the lower part of the revolution of the drum.

These guards or strippers *h, h*, are made to slide in the radial slots of the flanges *d, d, d*, by excentric wheels *k, k*, (seen in the section, fig. 4, and shewn by a dotted circle, in fig. 3); the peripheries of which excentric wheels act against the ends of all the strippers or guards, forcing them out to the extremities of the slots at some part of the rotation of the drum, and the springs drawing them inward again, at the opposite part of the rotation of the drum, keeping their ends continually bearing against the outer edges or peripheries of the excentric wheels.

The construction of the drum having been now fully described, and the mode of attaching thereto the heckle-bars and guards or strippers, it is necessary next to state, that this drum, when working, must be enclosed within a casing, of a cylindrical form. This casing consists of two circular wooden ends or discs, mounted upon the main axle or shaft *b*, on which they turn loosely, as shewn at *l, l*, in the horizontal section, fig. 4; and these circular ends or discs are held together by transverse bars, screwed thereto, the periphery or cylindrical part of the casing being partly formed by plates of zinc *m, m*, bent round, and attached to the edges of the discs; but some considerable portions of the periphery of the casing are left open, to admit the strick of flax, when submitted to the operation of the revolving heckles, and also to discharge the tow from the points of the heckle, as the heckling operation goes on. The open parts of the casing will be seen in the section, fig. 3.

Between the drum and the casing, on each side, one of the excentric wheels *k, k*, is placed, as shewn in the vertical and horizontal sections, figs. 3 and 4. These excentric wheels have each a circular aperture in their centre, lined with a collar or bush of steel, which enables the wheel to

turn freely upon a hollow stud or boss, *n, n*, fixed to the inside of the disc or end of the casing *l, l*. The hollow studs or bosses *n, n*, are so affixed to the discs or ends of the casing, as to allow of the main axle *b*, passing through them, in an excentric position, the consequence of which must be, that the peripheries of these excentric wheels will not run parallel with the periphery of the drum, but from their excentric positions will, at the lower part of the drum, force the guards or strippers (against which they are acting) along the slots toward the outer edges of the flanges *d, d*. By these means the whole depth of the heckle-points, when in the act of combing, will be allowed to operate upon the strick of flax, at the upper part of the machine, whilst, as the drum goes round in the lower part of its rotation, the strippers will be projected outwards, and cause the tow, upon the heckles, to be pushed toward their points, whence it is effectually stripped off, by a strong current of wind, produced by a rotary blower *p*, seen in fig. 3, which carries the tow away from the heckle-points, and deposits it in the box *q*, below, or projects it into a receptacle, placed for that purpose, at the back of the machine.

The manner in which the strick of flax is introduced into the machine, and progressively brought under the operation of the heckles, is as follows :—

The strick of flax is first spread out, as usual, and placed between the jaws of a pair of clams, as a holder, the construction of which holder is shewn in two positions at fig. 7. The upper jaws a, a, of the holder being thrown open, by turning back on their hinge-joints, the strick of flax is spread equally upon the rail b, b, and the jaws being then shut down, and held fast by a spring-catch c, the flax will be confined securely between the clams, ready to be operated upon by the rotary heckles.

At each end of the holder is a small rib or flange d, d, intended to be inserted into the nicks of two brackets *l*, affixed to the front part of the machine, as shewn at *v*, in fig. 2, and in the section, fig. 3.

The holder, with the strick of flax, being attached to the front part of the machine, as described and shewn in the

two last-mentioned figures, the flax must be spread upwards, over the outer surface of the cylindrical casing, and its ends passed through the opening in the casing at *s*, in order to bring the ends of the flax into the teeth of the heckles, upon the drum within. The drum is then made to revolve rapidly, by means of a band and pulley, or by any other moving power, applied to the main axle *b*, mounted upon the side standards or framing, by which the points of the revolving heckles will be made to take hold of the ends of the flax, and draw the fibres up tightly.

It will be perceived, that in commencing the operation upon the strick of flax, its ends only being passed through the opening in the cylindrical casing, a very short portion of the fibres are at first submitted to the points of the heckles. The reason for submitting but a small portion of the flax, at first, to the action of the heckles, is, that the process will be more beneficially conducted, when the length of the strick of flax is gradually introduced to the heckle-points, as, by that means, the tow is cleared away before the following heckles, and the staple or fibre of the flax is less liable to be broken. In order, therefore, to bring the whole length of the fibres gradually upon the points of the revolving heckles, the cylindrical casing is made to turn loosely upon the main axle, and advance slowly, as the process goes on, which causes the opening *s*, to be brought round from the top of the machine, down to the situation of the stationary holder at *r*. The means of effecting this movement of the casing is as follows:—

One end of a cord or chain *t*, *t*, is attached by a hook to the cylindrical casing *l*, and this cord or chain, being conducted over carrier pullies, and weighted at its reverse end, draws the casing back, that is, causes it to turn upon the main axle, so that the opening *r*, is brought to its highest position, as shewn in fig. 3, when the heckles are beginning to operate upon the strick. As, however, the casing must be slowly moved round, to admit gradually the whole length of the strick, a small pinion is fixed upon the end of the main axle, which, as the drum revolves, takes into and drives a toothed-wheel *u*, see figs. 1 and 2.—This wheel *u*,

is connected to a train of wheels and pinions, for the purpose of giving motion to a wheel *v*, turning loosely upon the end of a short axle *w*, placed transversely at the top of the machine, and mounted in bearings, affixed to the back part of the standards or frame-work, as shewn by dots in fig. 2. This axle *w*, with its clutch and other appendages, are represented detached from the machine, in a horizontal view, at fig. 8, and, in a back elevation, at fig. 9, carrying a snail or spiral pulley *x*, to which one end of a chain is affixed, the reverse end of this chain being connected to the cylindrical casing *l*, as shewn in the section, fig. 3.

By the diameters and numbers of the teeth of this train of wheels and pinions *u*, to *v*, it will be perceived, that the rotary motion, communicated from the main axle to the wheel *v*, will be very considerably reduced, and, consequently, that when this wheel is connected, by its clutch, to the axle *w*, the rotation of that axle and its snail or spiral pulley *x*, will be comparatively slow also; and hence the rotary movement of the cylindrical casing, carried round by the draft-chain, which connects it with the pulley, will be likewise slow, and indeed its rotary movement depending upon the coiling of the draft-chain round the spiral periphery of the pulley *x*, will necessarily diminish, as the opening *s*, in the casing, approaches its lowest position.

Let it now be considered, that by means of a horizontal lever and clutch, shewn at the top of the machine, in fig. 1, and also in the detached view, fig. 8, that the axle *w*, has been thrown into gear with the train of wheels *u*, *v*. The rotary motion of the heckling-drum will, as described, give motion, through the train, to the axle *w*, and pulley *x*, by which the draft-chain will be made to bring round the cylindrical casing, until the opening *s*, has arrived at the lowest part of its rotary movement, as shewn by dots in fig. 3. A small stud, set in the periphery of the cylindrical casing, will, by this movement, have been brought under the tail of a lever *y*, fig. 8; the position of which lever, in the machine, is also shewn by dots in figs. 1 and 2. This stud, by raising the tail of the lever *y*, causes a catch-pin to be withdrawn from the side of the sliding-clutch *z*, and

thereby allows the clutch-bolts to be thrown back by the force of a spring, which disengages the axle and spiral pulley from the wheel *v*.

The heckling-drum continues revolving, but the weighted cord or chain *t*, carries back the cylindrical casing again, so that the opening *s*, stands at its highest point, and the fibres of the flax being, by that means, withdrawn from the heckle-points, the combed or heckled strick must be removed, and another strick, to be operated upon, placed in holders and fixed in the brackets *r*, as before. The axle *w*, and spiral pulley *x*, must now again be thrown into gear with the train of wheels *u*, *v*, and the operations of the machine will go on, as before described.

By means of the excentric wheels *k*, *k*, the peripheries of which work against the under parts of the strippers *h*, *h*, in the manner already described, the strippers are slidden to the outer extremities of the radial slots, in the flanges d, d, at the lower part of the rotary movement of the drums, as shewn in the section, fig. 3. This sliding action of the strippers pushes off the tow that has accumulated upon the heckles toward their points, and in that situation a very powerful current of wind is, by means of a rotary fan below, brought upon the heckles, which blows off, and completely discharges the whole of the tow from the heckle points, and deposits it in a box or receptacle under or behind the machine.

The patentee claims, firstly, giving elasticity to the heckles; secondly, the mode of mounting them upon a rotary drum; thirdly, stripping the tow from the heckles, by means of the sliding strippers, worked by excentric wheels; fourthly, the cylindrical casing of the drum, and the mode of adapting it to regulate the gradual feeding in of the strick of flax; and fifthly, the peculiar manner of applying a powerful current of air to the surface of the heckle-drum, for the purpose of carrying off the tow.—[*Inrolled in the Petty Bag Office, January,* 1841.]

Specification drawn by Messrs. Newton and Son.

To George Gwynne, *of Portland-terrace, Regent's Park, Gent., for improvements in the manufacture of candles, and in operating upon oils and fats.*—[Sealed 10th March, 1840.]

The first part of this invention consists in treating oils and fats, with carbonated alkalies, for the purpose of producing better candles, and rendering oils more suitable for the various uses to which they are applied.

With respect to fats, the operation is as follows:—220 imperial gallons of cold water, and 280 lbs. of carbonate of potassa, (or, instead of potassa, 560 lbs. of carbonate of soda,) are placed in a vessel, and heated by the introduction of steam; when the mixture boils, 20 cwt. of tallow are added; and after boiling for eight hours, the steam is shut off, and the mixture allowed to stand, until the next day. By this time, the greater part of the water and carbonate of potassa (lye) will have settled; and being drawn off, the tallow is removed to another vessel, provided with a steam-jacket, and 280 lbs. of carbonate of potassa are mixed with it. On the admission of steam into the steam-jacket, the temperature is raised to 110° Fahr., and from that to 200°; the steam is then shut off, and the mixture allowed to stand for twelve hours; when this period has elapsed, the tallow is drawn off, and allowed to solidify. The remainder of the operation consists in submitting the tallow to a temperature of 200° Fahr., in a vessel furnished with a steam-jacket.

To refine oil, the patentee boils it with water and carbonate of potassa, in the same manner as tallow; and after the lye is drawn off, the oil is transferred into another vessel, in which it remains for eight hours, and then, any lye that may have settled, is drawn off. The oil is next removed to a vessel, furnished with a steam-jacket, and 280 lbs. of carbonate of potassa having been mixed with it, the temperature is raised to 200° Fahr. After standing for a day, the oil is drawn off, and the turbid appearance, which it presents, is removed, by subsidence or filtration.

The second improvement consists in a mode of treating, by distillation, in vacuo, fatty and oily matters, and their products, for the purposes mentioned in the first improvement.

The apparatus employed, is similar to that used by sugar refiners, and the vacuum-pan is heated by a coke fire, which is raised or lowered, by means of a rack and pinion.

The third improvement consists in treating, by distillation; and, when requisite, by repeated distillation, under atmospheric pressure, fatty acids and their products.

The fourth improvement consists in a mode of separating the fluid from the solid parts of fats and oils, by taking advantage of the different degrees of solubility which such matters offer when converted into salts.

A mixture, containing 560 lbs. of carbonate of potassa, 280 lbs. of lime, and 350 gallons of water, is first boiled up, in any suitable vessel. To this 20 cwt. of tallow are added, and, after boiling for an hour, the mixture is allowed to cool; it is then reduced to a thin paste, by the addition of water, and, having been first passed through a sieve, it is filtered through bags of twilled cotton, enclosed in linen bags. The fluid portion, which runs through the filter, is boiled with lime, and the compound of oily matter and lime is decomposed, by weak sulphuric acid. The solid matter, remaining in the filter, undergoes a similar operation, and a stearine wax, suitable for making candles, is thus obtained, without the employment of hydraulic pressure.

The patentee claims, Firstly.—The mode of refining fats and oils, by means of carbonated alkalies, as herein described, in order to obtain common candles, of a better quality than those now made, and to improve oils.

Secondly.—The distillation, in vacuo, of all fatty and oily matters, and all the bodies derived from them, directly or indirectly, by means of any agent or agents, or process or processes.

Thirdly.—The distillation, and, when requisite, the repeated distillation, under atmospheric pressure, of fatty acids and their products.

Fourthly.—The mode of separating the fluid from the

solid parts of fats and oils, by taking advantage of the different degrees of solubility which such bodies offer when converted into salts, as herein described.—[*Inrolled in the Inrolment Office, September,* 1840.]

To John Bethell, *of St. John's Hill, Wandsworth, in the county of Surrey, Gent., for improvements in treating and preparing certain oils and fatty matters.*—[Sealed 28th March, 1840.]

The object of this invention, so far as relates to the treating and preparing of oils, is to render certain of them, viz., whale, elephant whale, Newfoundland whale, seal, rapeseed, teel, olive, palm, cocoa-nut, or any of the other common oils, more useful, either for lubricating machinery, or for the purposes of illumination.

The improvements are effected, in the first instance, by separating, clarifying, or precipitating a portion of the gelatinous, albuminous, or other matters, contained therein; and secondly, (when such oils are required for burning in lamps or for illumination,) by adding thereto a portion of either of the hydrocarbons or essential oils, hereafter named.

As regards the treating and preparing of certain fatty matters, the object of this invention is, obtaining, in the manner hereinafter described, from "butter of palm," cocoa-nut oil, or any other vegetable concrete oil,—an oil which is more useful for mixing with those already purified.

The manner of carrying these improvements into effect, is described by the patentee as follows;—

"*First process.*—I take any or either of the common oils above named, and purify them from the gelatinous, albuminous, and other matters contained therein, by first thoroughly well mixing the oil with a solution of tamrin, which may be obtained from any of the vegetable matters yielding it; but I prefer using a strong infusion of gall-nuts, in hot water, of which I take ten gallons, and thoroughly mix it with 100 gallons of oil, in any con-

venient manner. This mixture must afterwards be allowed to rest for three or four days, until all the tamrin infusion and precipitate matter has settled. The clear supernatant oil is then drawn off, and again agitated and mixed with a solution of either acetate of lead, acetate of alumine, or sulphate of zinc, which I prefer using in the following proportions, viz.: one pound of acetate of lead, dissolved in six gallons of water, or one pound of acetate of alumine, dissolved in four gallons of water, or one pound of sulphate of zinc, dissolved in six gallons of water; and I mix ten gallons of either of such solutions with 100 gallons of oil; but I do not confine myself to these proportions, as solutions of different strengths can be advantageously used for different oils. The oil, after three or four days' rest, is drawn off from the top, and if not sufficiently clear, must be filtered through oil-bags, in the usual manner.

"During the period that the oil is undergoing the above operations, I prefer that it be kept at a temperature as near 70° Fahrenheit as possible. Should the oil be afterwards found to contain too much water, I cause it to be agitated with about ten per cent. of fresh calcined sulphate of lime, in fine powder, or well-dried carbonate of soda, for the purpose of abstracting the greater part of the water from it. The sulphate of lime or soda must be allowed to precipitate by rest, or the oil must be filtered through bags.

"*Second process.*—I take the oil, as purified by my first process, or I take the more fluid parts of cocoa-nut or palm oil, and, for the purpose of making a good burning lamp-oil, I add thereto from five to ten per cent. of either of the following essential oils or hydrocarbons, viz.: petroleum or rock oil, Persian naptha, fine oil of turpentine, or the best essential oil, obtained from the distillation of coal-tar, or the oil obtained, as hereinafter described, by distilling any of the above essential oils with palm or cocoa-nut oil. The quantity to be added, depending on the kind of oil operated upon, and its strength will vary between five and ten per cent., but will be easily ascertained by trying a small sample of the oil first.

"The essential oil or hydrocarbon must be intimately com-

bined with the oil, either through agitation or by passing the vapour of the essential oil or hydrocarbon into the oil, by an apparatus similar to "Wolfe's," but the former method I prefer, for general use.

"In some cases, either from the oils operated upon being of a superior quality, or from so fine an article not being required, it is not necessary to use both the above processes, as either of them will be found sufficient for the purpose. If a superior burning lamp oil is required, I prefer using both of the above processes, but the oil, for a commoner lamp may be prepared by one of the above processes, without being submitted to the other, particularly when it is prepared by the second process. For a lubricating oil, the first process only is used.

"As to the treating and preparing fatty matters, I take the 'butter of palm,' or 'rough palm-oil,' or 'rough cocoa-nut oil,' or any other concrete vegetable oil, and add to either of these about twenty per cent. of either of the essential oils above named; put it into a common still, and distill off the essential oil, and the volatile matter, which rises from the palm or cocoa-nut oil; but I prefer distilling with steam, and for that purpose, I put the mixture in a close wood vat, furnished with a steam-pipe, leading from a steam-boiler, and branching out into several other pipes, placed in the bottom of the vat, and pierced with small holes. The charging hole of the vat being shut, steam is driven through the mass, and the volatile products are conducted off through a pipe, fixed in the top of the vat to a common distilling worm, placed in cold water. The volatile oil, so condensed, I mix with the oil, for burning in lamps, as above mentioned, and the concrete fatty matter, remaining in the vat, is run out into casks, and will be found much improved, and more useful for many purposes.

"In describing my improvements, I have stated the proportions of the different materials to be used which I prefer, but I do not confine myself to such proportions, as they may be advantageously varied for different oils."—[*Inrolled in the Rolls Chapel Office, September,* 1840.]

To Miles Berry, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, patent agent, for certain improvements in treating, refining, and purifying oils,—being a communication.*—[Sealed 9th May, 1840.]

These improvements consist in refining and purifying whale oils, rendering them uncongealable, and also abstracting from them two products, viz., oleine and stearine.

The first process consists in removing any unpleasant smell and impure matter from the oil. For this purpose the oil is, in its original or rough state, heated by steam to 45° of Reaumer's thermometer; a clear solution of chlorine of soda at 15° is then added, in the proportion of one quarter the weight of oil to be acted on, and the mixture, after being stirred for about twenty minutes, is left for three days, in vats arranged for that purpose, to subside. When this time has elapsed, the liquor is drawn off from the precipitate, and treated with an infusion of acid of nutgalls, (gallic acid,) which unites with the gelatine existing in the oil; it is then stirred briskly for fifteen minutes, and nitric acid is added, in the proportion of two ounces to one hundred pounds of oil; the stirring is then continued for some minutes, and the oil is afterwards transferred to the vats, where it remains for three days, for the gelatine and other extraneous matters to precipitate. The oil being thus purified is drawn off from the sediment into vats, and is now ready for the next operation.

This process consists in separating the oleine and stearine. For every hundred pounds of oil, two pounds of acetate of alumine, two pounds of nitrate of potash, and two pounds of chromate of lime, are dissolved in water, in the proportion of five per cent., and added to the oil; the mixture is then stirred for twenty minutes. In an instant the action is such, that crystals of stearine may be seen to separate from the oleine; after remaining undisturbed for a day, the mixture is poured into felted bags of a conical shape, the oeline passes through, and the stearine is retained

in the bags, in the consistency of butter; this matter is afterwards submitted to rather strong pressure, in order to bring it to as hard a consistency as possible.

The patentee states, that the oleine is as soft as olive oil, it burns without smoke or smell, and may be very advantageously used for greasing wools in the cloth manufactures. —[*Inrolled in the Petty Bag Office, November*, 1840.]

Specification drawn by Messrs. Newton and Son.

To WILLIAM PALMER, *of Sutton-street, Clerkenwell, candle-maker, for improvements in the manufacture of candles, and in apparatus for applying light.*—[Sealed 25th March, 1840.]

THESE improvements consist, firstly, in the use of two or more platted wicks, which are formed by platting three cords of cotton, or other suitable material, together.

The object of this part of the invention, is to produce wicks of greater firmness than the ordinary ones, and likewise to give them an outward inclination as they are burned, which will cause a complete combustion of the wick, as the tallow is consumed.

The manner of inserting these wicks in the candle, in the positions to insure their proper inclination outwards, when burning, will be seen by reference to Plate XI.

Fig. 1, represents a rod or wire, at the ends of which notches are formed, the number corresponding to the wicks intended to be inserted; lengthways over this rod, the platted wicks are wound, the notches preventing them from slipping off. When the wicks are thus secured, the rod is placed in the candle-mould, where it remains until the candle, formed therein, is sufficiently hard. The rod, having been loosened from the wick, is then withdrawn, by means of the loop at its upper end.

The second part of this invention consists in concentrating and diffusing the light obtained from lamps, by means of lenses.

Fig. 2, is a plan, and fig. 3, a vertical section, (taken on

the line *a*, *b*, fig. 2,) of a circular frame, which is affixed to the gallery of the lamp. This frame carries the chimney *c*, and round it a series of openings *d*, *d*, are formed, to receive the bolt *e*, that carries the frame *f*, of the lens *g*; the larger end of the bolt *e*, passes through a slot in the frame *f*, so as to admit of the frame being raised or lowered, the screw *h*, retaining it in any desired position.

The patentee claims, Firstly.—The mode of manufacturing candles, by the application of the peculiarly formed wicks, herein described.

Secondly.—The mode of manufacturing candles, by the application of two or more platted wicks.

Thirdly.—The mode of applying lenses to lamps, as herein described.—[*Inrolled in the Inrolment Office, September*, 1840.]

To Francis Molineux, *of Walbrook-buildings, Gent., for improvements in the manufacture of candles, and in the means of consuming tallow, and other substances, for the purposes of light.*—[Sealed 23rd April, 1840.]

The first part of this invention applies to the manufacture of a novel sort of candle, and also to the method of burning the same, for the production of light.

The candle consists of a cylindrical block of tallow or other oleaginous substance, formed without a wick.

In Plate XI., a sectional drawing is shewn of the lamp, in which the candle is to be consumed. *a*, represents the candle, contained in the tube *b*, and forced up to the wicks *c*, *c*, by the spiral spring *d*. These wicks may be varied in number, according to the quantity of light required. They are each composed of a muslin tube, filled with cotton, and dipped into melted tallow.

The hooks *e*, *e*, projecting from the brackets *f*, *f*, that support the chimney *g*, are for the purpose of holding the wicks in their proper position. In the nozzle *h*, of the lamp, a number of openings *i*, are formed, for the admission of air, and on the upper part of the nozzle a ring or socket *j*, is screwed.

By reference to the drawing, it will be seen, that the brackets *f*, *f*, are attached to the ring *j*, therefore, on turning the ring, the wicks may be raised or lowered.

The second part of the invention applies to carriage-lamps; it consists in admitting air to the candle, through a number of tubes that support the nozzle of the lamp.

The patentee claims, Firstly.—The mode of manufacturing candles, and consuming tallow and other substances, herein described.

Secondly.—The mode, herein described, of introducing streams or currents of air into the nozzles of carriage-lamps. —[*Inrolled in the Inrolment Office, October*, 1840.]

To George Claudius Ash, *of Broad-street, Golden-square, in the county of Middlesex, dentist, for improvements in apparatus for fastening candles in candlesticks.*—[Sealed 12th June, 1841.]

This invention consists in securing candles in candlesticks, by inserting a metal filling-piece or elastic wedge between the candle and the side of the socket.

In Plate XI., fig. 1, represents a candlestick, partly in section, shewing the mode of securing a candle therein, by means of the elastic wedge; fig. 2, is a front view; fig. 3, a vertical section; and fig. 4, a plan of the filling-piece or wedge, shewing the form preferred by the patentee.

The elastic wedge is cut out of a sheet of steel or other suitable metal, and bent up to produce the two surfaces *a*, and *b*, which, when inserted in the socket of the candlestick, will, by their elastic action, press against the candle, and hold it firmly in an upright position.

The patentee states, that he is aware it has been proposed to construct candlesticks, with spring-holders or sockets for candles, in connection with, and forming part of, a candlestick; he does not, therefore, claim the retaining candles in candlesticks, by means of spring instruments, but he claims the mode of fastening candles

in candlesticks, by applying elastic metallic wedges or filling-pieces, which, being separate from the candlestick, may be used with different candlesticks, as above described.—[*Inrolled in the Inrolment Office, December,* 1841.]

To John Lee Stevens, *of King Edward-street, Borough, general agent, and* John King, *of College-hill, London, printer, for improvements in candlesticks, and other candle-holders.*—[Sealed 25th June, 1841.]

This invention relates to that part of a candlestick called the "push-up," and consists, firstly, in so constructing and arranging the parts connected therewith, that it may be raised or lowered by turning the nozzle of the candlestick.

In Plate XI., fig. 1, is a vertical section of a nozzle; and fig. 2, is a side view, partly in section, of a candlestick, suitably formed for receiving the nozzle, shewn at fig. 1. *a,* is the stem of the push-up, having a thread formed on it which takes into a female screw in the bottom *b,* of the nozzle. It will be seen, that as a revolving motion is given to the nozzle, the push-up will be raised or lowered, the stem being prevented from turning, in its ascent or descent, by the guides *c, c,* on its lower end, which move in the grooves *d, d,* in the shaft of the candlestick.

A modification of this arrangement is shewn at fig. 3. In this figure, the stem *e,* is square, and works in a square socket *f*; upon the edge of the disc *g,* a thread *h,* is formed, which takes into the spiral groove *i,* in the interior of the nozzle. By turning the nozzle, the push-up is elevated or depressed, as before mentioned with respect to figs. 1, and 2.

The second improvement consists in a mode of raising or lowering the push-up, by means of a screw on the lower end of its stem.

The stem extends to the lower end of the candlestick, and its screw works in a tube or collar, by turning which, the requisite motion is given to the push-up.

The patentees claim, Firstly, the application of an in-

ternal and external screw, for the purpose of causing the vertical motions, above mentioned, on turning the nozzle.

Secondly.—The raising of the candle by means of a spiral screw, working within a tube or collar.—[*Inrolled in the Inrolment Office, December,* 1841.]

To THOMAS SWEETAPPLE, *of Cotteshall Mill, Godalming, paper maker, for an improvement or improvements in the machinery for making paper.*—[Sealed 6th December, 1838.]

THIS invention is shewn in the specification applied to a Fourdrinier paper machine, but it may be used in all those machines where the paper is made upon an endless wire web, moving in a horizontal plane, or nearly so.

The improvements consist in placing one or more rectangular troughs below the horizontal surface of the endless web, which receives the pulp; these troughs are rather wider than the web, and contain a number of tubular rollers, similar to those used in a Fourdrinier machine, for the purpose of supporting the endless web. In consequence of the water draining through the web from the pulp, which is supplied to the machine, the troughs will be always full, and the endless web, in its forward movement, will skim along the surface of the water. By this means, the fibres of the pulp, being partly held in suspension by the water, will gradually subside, and deposit themselves in a direction longitudinal of the plane of the paper; thus, it is stated, a more perfect interlacing of the fibres will be effected, than is usually the case, when the water drains from the pulp, as it is delivered upon the endless web.

The patentee states, in conclusion, that his invention consists in "the application and use of an apparatus, such as hereinbefore described, to and with a machine for making paper, similar in principle to Fourdrinier's patent paper machine."—[*Inrolled in the Petty Bag Office, June,* 1839.]

To HENRY CROSSLEY, *of Hooper-square, London, civil engineer, for a new manufacture of paper.*—[Sealed 15th April, 1839.]

THIS invention consists in manufacturing paper from refuse tan, after it has been employed for tanning leather, or in any other process that will not destroy its fibres; and likewise in the employment of spent hops, after they have been used for brewing. These materials undergo the same operations of bleaching, &c., as the rags usually employed in the production of paper.

The patentee claims, as his invention, " the following manufacture; that is to say, paper, in the various forms, and for the various purposes now known, made of the fibrous parts of refuse tan, and of refuse or spent hops."—[*Inrolled in the Petty Bag Office, June,* 1839.]

To JOHN WINTERBORN, *of Clarence-place, Hackney-road, surgeon, for improvements in machinery to facilitate the removal of persons and property from premises in cases of fire; which improvements are applicable to raising and lowering weights generally, to assist servants cleaning windows, and as a substitute for scaffolding.*—[Sealed 22nd May, 1841.]

THE improved apparatus, which is the subject of this invention, is shewn in section at fig. 1, in Plate XI.; it consists of a long tube *a*, closed at its lower end, and furnished with a spike *b*, which enters the ground, and prevents the apparatus from slipping. The tube *a*, receives a pole *c*, provided at its lower end with a pulley *d*, and having at its upper end a hole sunk in it, to receive the stem of the hook *e*;—*f*, is a cord, passing over the pullies *g*, *g*, at the top of the tube *a*, and under the pulley *d*, for the purpose of raising the pole *c*.

When the apparatus is brought to the premises on fire, the pole *c*, is raised, by pulling the rope *f*, and the hook *e*, is attached to the window-sill, or any other convenient part

of the building; the pole *c*, is then lowered, and the hook *e*, left suspended. The prongs *h*, *h*, are intended to keep the hook firm to its hold, when any strain is applied thereto. From the outer side of the stem of the hook, an arm *i*, projects, carrying two blocks and tackle, by means of which a platform, for the reception of persons and goods, is raised and lowered.

Fig. 2, shews the mode of employing this apparatus as a substitute for scaffolding. In this case, several hooks are used, and from each, by means of a short rope *j*, a beam *k*, is suspended, carrying the planking *l*, *l*, *l*, of the scaffold; the rope *j*, passes through the ends of two bars *m*, *n*; the lower bar *n*, serves to keep the planks *l*, *l*, *l*, from shifting. —[*Inrolled in the Inrolment Office, November*, 1841.]

To Christopher Dumont, *of No.* 4, *Mark-lane, in the city of London, Gent., for an improvement in the manufacture of metallic letters, figures, and other devices, —being a communication.*—[Sealed 22nd May, 1841.]

This invention relates to the manufacture of metallic letters, figures, &c., used for shop fronts, and other similar purposes, and consists in forming the letter or figure, and cutting it out by a single blow.

The drawing in Plate XI. represents a section of the dies used in the manufacture of the letters, &c. *a*, is the lower die, which has a projecting angular edge *c*, *c*, formed around the figure of the letter; and *b*, is the upper die or "force;" in the face of which, an angular groove *d*, *d*, is made, to receive the angular edge *c*, *c*, of the lower die. The sheet of metal *e*, from which the letter is to be formed, is placed on the angular edge *c*, *c*, and the force being then applied, the letter is cut out, which will afterwards require but little or no dressing at the edges.

The patentee claims the improved manufacture of letters, figures, and other devices, in relief, by stamping or pressing, and cutting them out of thin metallic plates.—*Inrolled in the Inrolment Office, November*, 1841.]

To William Orme, *of Stourbridge, in the county of Worcester, iron-master, for improvements in the manufacture of cofered spades, and other cofered tools.*—[Sealed 18th February, 1841.]

These improvements consist in forming the mould of the spade or other tool of one piece of iron, instead of welding two "half moulds" together, as usual. The straps of the spade are produced by making the mould red hot, and splitting the part that is to form the straps, by means of a circular saw; the straps are then opened out by a wedge-shaped tool, which is driven into the mould to form the cofer. The mould is finished, and the cutting edges "steeled" in the usual manner.

The patentee claims the mode of making cofered spades, and other cofered tools, by dispensing with the use of the two half moulds, heretofore employed in making such spades or tools; and also the mode of forming the straps and cofers of spades and other tools.—[*Inrolled in the Inrolment Office, August,* 1841.]

To Henry Newson Brewer, *of Jamaica-row, Bermondsey, mast and block maker, for an improvement or improvements in wooden blocks for ships' rigging, tackles, and other purposes, where pullies are used.*—[Sealed 3rd March, 1841.]

This improvement consists merely in altering the direction of the grain of the wood, so that instead of its lying parallel to the strap or band of the block, and in a line with the direction of the straining force to which the blocks may be exposed, as, in the present construction, it will be at right angles to the strap, and also to the direction of the straining force.—[*Inrolled in the Petty Bag Office, September,* 1841.]

To Morris West Ruthven, *of Rotherham, in the county of York, engineer, for a new mode of increasing the power of certain media, when acted upon by rotary fans, or other similar apparatus.*—[Sealed 22nd March, 1841.]

This invention consists in causing the air, gas, or other media, to pass through a series of rotary fans, which act in succession upon it, and increase its power, and finally force it out of the exit pipe of the last fan, in the shape of a strong blast. To effect this, the exit pipe of one fan, is made the entrance pipe of the next fan, and so on throughout the series; thus, each fan will act on the air or other media, as it passes through it, and increase the force communicated to it by the preceding fan.

The patentee claims increasing the power of the said media, when acted upon by rotary fans, or other similar apparatus, by causing it to pass directly from one fan to another, throughout the whole series, each succeeding fan acting upon it in the state in which it left the preceding one, in consequence of the eduction passage for the air, from one fan, forming the induction passage of the next fan, as above described.—[*Inrolled in the Inrolment Office, September,* 1841.]

To Joseph Clisild Daniell, *of Tiverton Mills, near Bath, for improvements in making and preparing food for cattle.*—[Sealed 31st March, 1842.]

The first improvement consists in preparing ligneous matters, such as coppice-wood, brush-wood, hedge-wood, brambles, furze, gorse, heath, or any other fibrous matter partaking of the nature of wood, for feeding cattle, by reducing them to a fine powder.

The pulverized ligneous matter is used in the following proportions:—For horses, half a peck of ligneous matter, a bushel of chaff, and one pint of corn, are mixed together, and moistened, either by steaming, or by the addition of

water, or a solution, composed of eight ounces of soda to one gallon of water.

For horned cattle and sheep, half a peck of ligneous matter is mixed with one bushel of chaff, and moistened as above. This mixture is used alone, or an addition may be made of half a bushel of grains, or crushed potatoes, parsnips, carrots, turnips, or mangel-wurzel.

For store pigs, one bushel of grains, or crushed potatoes, parsnips, &c., and half a bushel of ligneous matter, are mixed with the wash; or three pecks of ligneous matter and one peck of barley meal; or else, an equal quantity of ligneous matter and bran.

For fattening pigs, barley meal and ligneous matter, in equal quantities, are mixed with the wash.

The second improvement consists in a mode of operating upon grass, hay, wheat or barley straw, bean or pea halm, or any other sort of straw or halm, previous to using the same as food for cattle.

A quantity of the straw, halm, or hay, in a dry state, is mixed with double its weight of fresh mown grass, and placed in a tank or vat, provided with a steam-jacket; into this jacket, steam is admitted, and at the expiration of twenty-four hours, the straw will have become saturated with the moisture arising from the grass. A current of atmospheric air is now forced through the vat, for six or eight hours, by means of an air-pump, and a considerable portion of the moisture being thus carried off, the matters operated upon are ready for immediate consumption, or may be stacked for future use.

The patentee claims, Firstly.—The mode of making and preparing food for cattle, by pulverizing ligneous matters, and applying the same to feed cattle.

Secondly.—The mode of treating all kinds of grass and straw, or halm, or grass, and hay, in a vat or tank, when preparing the same for the food of cattle, as described.—[*Inrolled in the Inrolment Office, September,* 1842.]

Scientific Ajudication.

REPORT OF THE CASE
OF
BROWN *v* ANNANDALE AND SON,

(On Appeal from the Court of Session in Scotland,)

DECIDED BY THE HOUSE OF LORDS, ON FRIDAY, FEB. 25TH, 1842.

With some Observations upon the probable Effect of the Decision upon existing Patents.

BY CHARLES SHEARMAN, GENT., OF GRAY'S INN.

(ONE OF THE RESPONDENTS' AGENTS.)

In the House of Lords.

JAMES BROWN, *of Esk Mills, in the Parish of Penicuik and County of Edinburgh* - - - - - -	Appellant.
ALEXANDER ANNANDALE & SON, *Paper Manufacturers, at Polton near Lasswade, in the County of Edinburgh* - - - - - - -	Respondents.

This was an appeal from the First Division of the Court of Session of Scotland, wherein the appellant complained of certain interlocutors pronounced by the Court below, under dates, respectively, of the 8th and 13th July, 1841. The case arose out of the following circumstances:—

The pursuer, James Brown, had, on the 4th of February, 1836, obtained letters patent for that part of the United Kingdom called Scotland, for an alleged invention of "a certain improvement or certain improvements in the making or manufacturing of paper," a specification or description of which invention he caused to be inrolled in Her Majesty's Chancery in Scotland, on the 4th June, 1836, agreeably to the usual proviso contained in such grants. The particulars of the supposed invention it is unnecessary to state, as the point upon which the present appeal was brought, was entirely independent of what may be termed the merits of the case, and although a variety of important questions were raised in the Court below, both upon the sufficiency of the specification, and as to the fact of there having been any infringement as alleged, it is not proposed to do more, in the present report, than to state the few admitted facts upon which the point, brought before their Lordships, turned.

The defendants having used, in their paper-works, the machine of a Mr. Evans, of Birmingham, (who had likewise obtained a patent for certain improvements in paper-making machinery,) were attacked by the pursuer, by what is called, in Scotland, an action of suspension and interdict, (which is a proceeding analogous to a bill for an injunction in the English Courts of Equity,) complaining of an alleged infringement of the pursuer's patent of 4th February, 1836. The defenders put in answers to the pursuer's note of suspension, setting forth their grounds of defence, whereupon no injunction was applied for by the pursuer, but he shortly afterwards followed up his proceedings, by an action for damages, in order to try the validity of his patent and of the defences set up against his claim to the summary interference of the Court.

The two actions being, (according to the practice of the Scotch Courts) conjoined, a record was made up and sent for trial, before the Jury Court, upon the following admissions and issues:—

"It being admitted that, on the 4th day of February, 1836, the pursuer obtained letters patent under the Great Seal used in Scotland in place of the Great Seal thereof, whereby there was granted the exclusive privilege, during the period of fourteen years from the said 4th February, 1836, of using, as his original invention, certain machinery, as described in the said letters patent, and in the specification inrolled in the Court of Chancery, for the application, in paper-making, of a vacuum to the horizontal web of wire-cloth of a Fourdrinier machine, in the manner described in the said specification:

"Whether, during all or any part of the years 1839 and 1840, at the paper-mill works of the defenders at Polton, subsequent to the date of the said letters-patent and the said specification, the defenders, by themselves or others, without the consent or permission of the pursuer, wrongfully, and in contravention of the said letters-patent, used, in their said works, machinery in imitation of, and substantially the same with, the machinery described in the said specification, to the loss, injury, and damage of the pursuer? Or,—

"Whether the said machinery, described in the said specification, *is not the original invention of the pursuer?*

"Whether a machine or machines, constructed according to the description in the said letters-patent and specification, is not practically useful for the purpose therein set forth?

"Whether the description of the machine, contained in the said specification, is not such as to enable workmen, of ordinary skill, to make a machine capable of producing the effects set forth in the said patent?

"Damages laid at £1000."

These issues came to be tried before Lord Mackenzie, one of the Judges of the First Division of the Court of Session, and a Jury, on the 14th and 15th days of May, 1841; and after the evidence, on the pursuer's part, had been concluded, the counsel for the defenders, in his address to the Jury, stated, that it would be part of the defenders' case to bring evidence to prove, *inter alia*, his averment on the record, that the invention, specified by the pursuer, *had been publicly used* in England *before the date of his patent*. Whereupon the admissibility of any such evidence was objected to by the pursuer's counsel, on the ground, that previous public use of the invention in England was *not* a ground for invalidating the pursuer's patent in Scotland. Lord Mackenzie over-ruled the objection, and decided, that the evidence

was admissible, as proving a ground of the invalidity of the patent. Against this judgment the counsel for the pursuer excepted and lodged the following minute:—

"In respect of the opinion of the Judge, that the use and practice averred as to England, is competent, in evidence, to establish the first issue for the defenders, the pursuer admits, that the verdict must, *in point of fact*, go on that first issue for the defenders, subject to exception to the opinion of the Judge; the pursuer admitting that, if the above point of law is decided against him, *the defenders are entitled to judgment in the cause.*"

Upon which the Jury pronounced the following verdict:—"*In respect of the matters proven before them, and of the minute by the counsel for the pursuer, we find for the defenders on the first issue for the defenders.*"

The Bill of Exceptions came to be argued before their Lordships of the First Division of the Court of Session, when on the 8th of July, 1841, they pronounced the following interlocutor:—"The Lords having heard counsel for the parties, disallow this Bill of Exceptions."

On the 13th July, 1841, the above decision, in favour of the defenders, was further carried out by the following additional interlocutor or decree:—

"The Lords, in respect of the verdict of the Jury in this cause, apply the same; and, in the process of suspension and interdict, find the letters orderly proceeded, and dismiss the suspension; and, in the action of declarator and damages, assoilzie the defenders from the conclusions of the summons, and decern; find the defenders entitled to expenses in said conjoined actions, and remit the accounts when lodged to the auditor to tax and report."

Against these two interlocutors of the 8th and 13th July, 1841, the appellant (the pursuer below) brought the present appeal, praying that their Lordships would be pleased to reverse, vary, or alter the same, or that he might have such relief in the premises as to their Lordships should seem meet.

It will be seen, from the foregoing short abstract of the proceedings below, that there was thus distinctly raised, for the opinion of the Court of Last Resort, this very important question, namely:—'Whether it is essential to the validity of a Scotch patent, that the invention, for which it is granted, should be *new* throughout Great Britain?' or, in other words, 'Whether evidence of the knowledge or use of the invention in England, prior to the date of the patent in Scotland, was sufficient to destroy the grant?'

It will probably be expected that, in a report upon a case of this kind, the reasons or grounds relied upon by the several parties, to support their respective views of the law upon the question in dispute between them, should be stated in their own words. There will be the less hesitation in doing this, as it is well known, that these 'Reasons' are prepared by counsel of great eminence, after the fullest consideration of the law of the case, and of the authorities bearing upon it, and that they bear the attestation of their signatures before they are admitted into the printed cases laid before their Lordships' House.

The following were the 'Reasons' assigned, on the part of the appellant, and upon which he contended, that the decision of the Court below was erroneous:—

APPELLANT'S REASONS.

"I. *Because there is no communication of rights, under patents for inventions, between the subjects of the two parts of the United Kingdom, and therefore the fact, that the improvement, invented by the appellant in Scotland, had been previously used in England, is not a ground in law for invalidating his patent for Scotland.*

"The power of the Crown of Scotland, to grant to the authors of new inventions in the useful arts, the exclusive privilege, for a reasonable period, of enjoying the advantages resulting from their discoveries, has not been established by any special statute, but is founded solely on immemorial usage on the part of the Crown to make such grants, and the uniform acquiescence of the nation..

"At one time, attempts were made to stretch this branch of the royal prerogative beyond its limits, by the creation of perpetual and oppressive monopolies in particular articles of trade and commerce. These abuses, however, having been complained of, were put an end to by the act 1641, c 63, which specially annulled certain monopolies of that nature, already granted, and and condemned as illegal the making of similar grants in all time coming. It is true that this statute, with all the other enactments made by the Scottish Parliament, during the troubles in the reign of Charles I., fell under the general recissory act 1661, c. 15. But although never renewed, the enactment referred to has always been considered effectual, on account of its benefit to commerce, and as declaratory of the principles of the constitution.

"The act 1641, however, while it discharged monopolies prejudicial to the public, did not in any degree call in question or abridge the right of the Crown to grant patents for useful inventions, but left that matter, without any statutory restriction, to be regulated, as before, by the principles and practice of the common law, which, while it fully recognised the policy and justice of rewarding those by whose successful exertions the community had been benefited, by securing to them, for a competent period, the fruits of their labours, was equally hostile, on the other hand, to any prolonged interference with the freedom of trade and industry.

"With respect to the number of years, for which patents for inventions were formerly in use to be granted in Scotland, it appears that there was no precise limitation in that respect. Some were granted for a longer, and some for a shorter period, varying generally from thirteen to twenty-one years, but none, so far as the appellant has discovered, extending beyond the latter of these terms. For example, in the *Register of the Great Seal, where all such grants are recorded, there is a patent for a new invention in the manufacture of iron, granted by James VI. of Scotland, to Sir George Bruce, bearing date 23d April, 1614, and to endure '*pro spatio tredecim annorum datum praesentium proxime sequent.*' Another patent by James VI. to James Shevis, M.D., for a machine, to raise water from coal pits, is granted in 1616, '*pro spatio viginti-unius annorum diem dati praesentium subsequent.*' And on the 22d November, 1660,† John Brown obtained a patent, of similar endurance with the one last mentioned, for a mode, not before practised in Scotland, of refining sugar.

"On this point, the appellant may also take the liberty of referring to Dallas' System of Styles,§ printed at Edinburgh in 1697, in which, as a specimen of the usual terms of a Scotch patent of invention in his time, there is given the form of one granted, for *fourteen years*, to certain merchants of the city of London, 'to exercise the art of weighing up and recovering ships, &c., in the Scotch seas and harbours.'

"The term of fourteen years, thus set down in Dallas' Style Book, was the same as that to which patents of invention had been restricted in England,

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* Reg. Mag. Sigil. Lib. I. No. 243. † I. V. & VI. No. 186. § Dallas' Styles, p. 137.

by the statute 21st James I., abolishing monopolies. Since the Union of the two Kingdoms, there has been no alteration of the practice in Scotland in this respect, except that the endurance of the privilege is now constantly limited in the patent to fourteen years.

"It would, however, be a great error to suppose, that this coincidence in the practice of the two countries, arose either from any binding force which the English statute could have in Scotland, or from an extension of its provisions to Scotland by virtue of the Union of the Kingdoms. The appellant has already shewn, that in Scotland the right of the Crown to grant exclusive privileges, for a limited time, to the authors or importers of useful inventions, is founded exclusively on the common law, while in England, on the other hand, as laid down by all the authorities, it depends on the statute of 21st James I., c. 3, sec. 6.

"But farther, the grants, by which such rights are constituted in the two countries, respectively, and the extent of the rights themselves thereby conferred on the grantees, have continued since the Union, to be just as distinct and separate as they were before that event. A patent granted for England, does not extend to Scotland; and, *vice versa*, a patent for Scotland does not extend to England. The right under a patent for either country is confined solely to that country; and thus it may, and often does happen, that the same article, for which a patent has been granted in the one country, and as to the using or vending of which, therefore, in that country, the patentee enjoys an exclusive right, shall be free and unrestricted to all the Queen's subjects in the other country. This shews clearly that, notwithstanding the Union, there is no communication of the law of patents, or of the rights arising under such grants, between the two countries, but that, in regard to this matter, each part of the United Kingdom must be considered as a distinct, separate, and independent country and jurisdiction, relatively to the other.

"If it were otherwise—that is, if, since the Union of the two Kingdoms, England and Scotland were to be considered as but one country, in relation to such questions as the present—it is manifest that the legitimate and necessary result would be, that all rights of patent for inventions should be co-extensive, and equally effectual in both parts of the United Kingdom. But that conclusion being directly at variance with the acknowledged state of the fact, the premises which lead to it must be unsound. To say, therefore, that the two Kingdoms of Scotland and England are now united into one Kingdom by the name of Great Britain, of which all the subjects are entitled to free intercourse of trade and commerce with all places within the said United Kingdom, is to found on a proposition, which, though undoubtedly true in regard to all articles which are not under any legal restriction, in either or both parts of the United Kingdom, is nevertheless wholly irrelevant to the subject of present inquiry relative to rights under patents for inventions, seeing it is conceded that, notwithstanding the Union, one patent would not be effectual for both England and Scotland; that a patent granted for England is limited in point of extent to England, and a patent for Scotland in like manner limited to Scotland; and consequently, that the freedom and intercourse of trade referred to in the articles of Union, does not extend to such rights of patent in either country. Nor are patents of invention the only rights, as to which, even in matters strictly relating to trade, a similar distinction continues to exist between the laws of the two countries. By the Scottish statutes in favor of the Royal Burghs, and particularly by the Act 1693, c. 12, the exclusive right of importing all foreign commodities for sale is conferred on the merchant-freemen of the Royal Burghs. Now, although the articles of Union declare that there shall be full freedom and intercourse of trade to all the subjects of the United Kingdom, yet it has been solemnly adjudged in the case of the *Incorporated Trades of Aberdeen against the Magistrates and Guildry, 28th May*, 1793,* that none but the guild-brethren, as

* Mor Dict page 1979.

contra-distinguished even from the trades of the burgh, could import from England, commodities which were either the native produce of that country, or of the colonies abroad. This decision, (overruling an opposite one in the prior case of *Smith* v. *the Guildry of Inverness*, 16th December, 1757,) proceeded on the footing that the privileges of the Royal Burghs of Scotland were reserved by the Union; and that, according to the legal construction of the word 'foreign' in the statutes conferring those privileges, that character must still be held to apply to England. But the case, as to rights under patents for inventions, is evidently much stronger; for 1*st*. Such patents are, in their own nature, matters of *private right*, constituted by grant, *ex speciali gratia* of the Crown, and accordingly pass in Scotland under the Seal appointed by the 24th article of the Treaty of Union, 'to be kept and used in Scotland in all things relating to private right, or grants which have usually passed under the Great Seal of Scotland, and which only concern offices, grants, commissions, and private rights, within that Kingdom;' 2*nd*. —It is indisputable that, in regard to patents of this nature, there is no interchange of rights and privileges between the subjects of the two parts of the United Kingdom; but that, on the contrary, a patent granted in the one country is entirely confined to that country, and has no effect whatever in the other. But, *except* in regard to *such* privileges and advantages of trade and commerce, as to which it was provided by the Treaty of Union, that there should be *full freedom and intercourse* between the subjects of the United Kingdom, - and the laws concerning the regulation of which were therefore to be the same in Scotland after the Union as in England, the 18th article of the Treaty of Union expressly declared 'that *all other laws* in use within the Kingdom of Scotland, do, after the Union, *remain in the same force as before*.

"The result of the foregoing considerations just comes to this: that, in regard to all questions touching the validity of a patent for Scotland, the matter must be tried and determined according to the law of that country alone, and consequently without reference to the legal state and condition of the article, forming the subject of the patent, as to freedom or restriction, in England or any other country. In stating this, the appellant certainly does not mean to say, that the law of Scotland, as to the general requisites, and construction of patents, differs from that of England, except as regards the limits of their respective jurisdiction, and the consequences naturally arising from that consideration. On the contrary, he admits, that, as might have been expected from the similarity of the general policy and principles on which such rights are founded in both countries, a corresponding uniformity has been produced in the rules of the law of Scotland and that of England on this subject. But what the appellant does maintain, is, that in applying those rules to the case of a Scotch patent, the matter must be considered solely with reference to its validity in Scotland, and the effect of the rights arising under it in that country, to which alone those rights are confined, just as if England had no connection with it."

"II. *Because, according to the just construction and true meaning of the patent granted to the appellant for Scotland, the only thing required, as to the novelty of the improvement, is that it was invented in Scotland by the appellant: and there is no condition, express or implied, that the mere circumstance of its having been previously known or used in England, should infer a nullity of the patent*."

"The patent first *recites* the petition of James Brown, (the appellant,) setting forth that he had discovered a certain improvement in the manufacturing of paper.—'Quam inventionem credit pro generali beneficio et commodo futuram esse, dictam inventionem novam esse, et haud unquam antehac factitatam aut usitatam fuisse per ullam aliam personam aut personas quascumque intra hac regna, ut intelligit et credit. Petitor, igitur, humillime supplicavit ut nobis gratiose placuerit concedere sibi, executoribus, adminis-

tratoribus, et assignatis ejus, nostras regias literas patentes, sub sigillo per unionis tractatum appunctuat utend. in loco magni sigilli Scotiæ, pro sola factitatione, usitatione, exercitatione, et venditione, dictae ejus inventionis, omnique alio beneficio et commodo ejusdem intra illam partem Regni nostri Uniti Magnæ Britanniæ et Hiberniæ, Scotiam vocatam, pro termino quatuordecim annorum, secundum statutum in eo casu factum et provisum: Nos, autem, omnes artes et inventiones quæ ad bonum publicum et commodum conducere possint, promovere volentes: idcirco, ex gratia nostra,' &c. It then proceeds, in the usual form, to *grant* to the said James Brown, the sole privilege of using and exercising the said invention within that part of the United Kingdom called Scotland, and of enjoying the whole profits and emoluments therein arising 'pro et durante termino annorum in præsentibus mentionato. *Tenend.* et *habend.* exercend. et potiund, dictam licentiam, potestates, privilegia, et commoditates in præsentibus, supra concess. vel concedi mentiona, dicto Jacobo Brown, executoribus, administratoribus, vel assignatis suis, pro et durante spatio quatuordecim annorum, et usque ad plenum exitum et terminum eorum a data præsentium proxime et immediate insequent.' After which follows the condition thus expressed:—'*Proviso* semper, sicuti tenore præsentium expresse provisum et declaratum est, ut si quovis tempore durante dicto termino, per præsentes concesso, nobis hæredibus et successoribus nostris, aut quibuslibet sex vel pluribus eorum qui nobis vel illis a secretoribus conciliis erunt, manifestum reddetur hanc nostram concessionem legi contrariam, vel subditis nostris majore exparte damnosam vel incommodam esse, vel dictam inventionem quoad publicum ejus, in illa parte Regni nostri Uniti, Scotia vocata, usum et exercitium, non esse novam inventionem, vel a dicto Jacobo Brown, ut prædicitur non esse inventam: Tum, per ejus rei significationem a nobis hæredibus vel successoribus nostris, sub nostrum vel eorum signeto vel sigillo privato, vel a dominis aliisque nostri vel eorum secreti concilii, vel quibuslibet sex vel pluribus eorum sub eorum manibus et sigillis faciendam præsentes hae literæ penitus cessabunt, finem capient, ac prorsus ad omnes intentiones et proposita, irritæ fient, quacunque re in hac carta supra contenta in contrarium nulla-tenus obstante.'

"Now the first remark that occurs upon the terms of this patent, relates to the reference which, in the *petition* therein recited, is made to the *statute* regulating the endurance of the grant,—'secundum statutum in eo casu factum et provisum.' There can be no doubt that the statute here referred to, is the English act 21st James I.; and some attempt may possibly be made to found on this circumstance, as inconsistent with the appellant's argument as to the foundation on which the law of patents stands in Scotland. But it will be carefully kept in view that in the *dispositive* or *granting* clause of the patent, as well as in the *tenendum*, the limitation is simply 'pro et durante spatio quatuordecim annorum a dato præsentium,' *without any reference to that or any other statute*. This, however, is different from the form of patents for inventions in *England;* the *tenendum* of which, after expressing the term of fourteen years, uniformly contains the words, '*according to the statute in such case made and provided;*'—*whether with reference to the term of years only, or generally to the authority on which the grant proceeds, the appellant shall not presume to offer any opinion; although, if the latter construction be the true one, it would just afford a still stronger illustration of the difference between an English and Scotch patent, in regard to the legal footing on which the right of the Crown to grant them in the two countries respectively rests.

"Next, with respect to that part of the *petition*, as recited in the patent, which states the belief of the petitioner (appellant) that the invention had not been previously used by any other persons, '*intra hæ regna*,' it must be obvious, from what has been already said, that the insertion of these words, so far as applicable to other portions of the United Kingdom different from Scotland,

* Vide Godson on Patents, App. No. 3.

although perfectly consistent with the fact, as regards the knowledge and belief of the appellant at the time, was in itself quite superfluous and immaterial. Accordingly, the appellant observes, from an examination of the register of patents which have been granted for Scotland during the last two years, that the uniform style of the petition since the commencement of that period, is to confine the statement to the circumstances of the invention not having been previously used *in Scotland*, to the knowledge or belief of the petitioner. And what is of still more importance to be attended to, the *condition under which the present patent is granted*, is expressly *so* limited, by the words of the *proviso* above quoted,-- declaring the nullity of the grant in case it should appear 'dictam inventionem, quoad publicum ejus, in illa parte Regni nostri Uniti, *Scotia* vocata, usum et exercitium, non esse novam inventionem.

"With these explanations, then, the question is reduced to this:—What, according to their true construction and meaning, are the conditions under which the patent in favour of the appellant is granted, in reference to the *novelty* of his invention,--and do those conditions express or imply, as assumed in the judgment appealed from, that the said invention had not been previously known or used in *England*?

"In discussing this point, it is indispensable to keep the argument quite clear from all such considerations, as might have arisen upon a state of the fact different from that which is set forth in the Bill of Exceptions, and which the Court below has found to be *per se* a sufficient ground in law for voiding the patent. That fact is simply, that previous to the date of the appellant's patent for Scotland, the invention had been used in England. There is no statement to the effect that it was previously used in Scotland. It is not even stated that its previous use in England was known to the appellant, when he applied for a patent for Scotland. Had the fact been so, it is easy to see that a different question might have arisen; namely, how far a misrepresentation in the petition as to that particular, would vitiate a patent, even supposing the invention to have been first introduced into Scotland by the party applying for it. But no such question is, or can be raised, on the statement in the present Bill of Exceptions, which, as already noticed, is solely and exclusively confined to the fact of the previous use of the invention in England.

"The *first* part of the *proviso* in the patent, expressing the terms on which the right was granted, and on which its validity was thereby declared to depend, is, that the said invention is 'a new invention, as to the public use and exercise thereof, *in that part of our United Kingdom called Scotland*.' Now, —independently altogether of the qualification as to the '*public use and exercise of the invention*,' upon which the appellant does not mean to lay any stress,—it appears to be as clear and incontrovertible, as any proposition can be, that if a thing is *invented* in Scotland, it is a new invention in *that* country, although it had been previously invented and used in England. Under such circumstances, the invention in Scotland, though not *absolutely*, with reference to all the world, the *first* invention, yet, *with reference to Scotland*, it is a *new* invention. But this completely satisfies the terms of this condition of the patent, which only requires that the invention should be a new invention in Scotland. Therefore, the fact that the invention had been previously used in England, is no voidance of the patent, so far as regards the effect of the proviso which has just been considered.

"The construction here contended for seems to be supported by the construction put upon the statute of 21st James I. c. 3, and patents granted thereunder by the English courts.

"The patents and grants which are valid under the 6th section of that statute, are patents and grants 'of the sole working or making of any manner of new manufactures within this realm to the true inventor and inventors of such manufactures, which others, at the time of the making such letters patent and grants, shall not use.'

" Yet it was held soon after the statute, that a patent granted for a thing which had been before practised beyond sea, to the person who introduced it into England, was good and valid; (*Edgebury* v. *Stephens*, 2 *Salk*. 447;) and this construction has continued to be put upon that clause, and subsequent practice has confirmed it.*

" The *second* requisite, as expressed in the patent, is, 'that the said invention shall have been invented *by the said James Brown*.' But if truly invented by him—a fact which is not brought into question—there can be no force or relevancy in the statement, that it had been previously invented by another in England. For it is evidently quite possible, that the same thing may be found out by two different persons, either in the same or in different countries, and either simultaneously or at different times. An art, formerly practised, may have been totally lost; or a machine used in another country, may be wholly unknown here; and surely any person, who, by the application of the powers of his own mind, shall restore the one or invent the other, in this country, is not less entitled to the character of a discoverer or inventor than he would have been, if the art referred to had never been before known, or the machine used elsewhere. It seems therefore impossible to maintain, that according to the plain meaning and express terms of this patent, the improvement in question was not invented by the appellant, merely because, without his knowledge, it had been previously invented and used in England. And the appellant need hardly add, that the advantages resulting from his invention to the inhabitants of Scotland, could not be lessened by the circumstance of its having, while still unknown there, been practised in the neighbouring country.

" In arriving at the conclusion which they did, it is understood that the Court below were chiefly influenced by a decision of this House, affirming a judgment of the Court of Session, in the prior case *Roebuck and Garbett* v. *Stirling and Son*, 27th May, 1774. For when the Bill of Exceptions came to be advised, nothing more was said by any of the Judges, than that the case of Roebuck was a direct precedent, and that they were bound to decide in conformity with it.

" Upon a careful examination, however, of the circumstances of the case of Roebuck, the appellant hopes to satisfy your Lordships that they were different from those of the present in various essential particulars. The facts, which there occurred, as collected from the statements and evidence referred to in the Appeal Cases, were as follows:—In 1771, Dr. John Roebuck and Samuel Garbett obtained a patent in Scotland, for a mode of manufacturing oil of vitriol in *vessels of lead*. Previous to this, it appeared that they had carried on the same manufactory, for fourteen years, at their works at Prestonpans, near Edinburgh. Shortly after the date of their patent, Roebuck and Garbett presented a bill of suspension and interdict against Stirling and Son, merchants in Glasgow, to have them prohibited from proceeding with certain buildings, which the latter were in the course of erecting for the purpose of carrying on a similar manufactory. In discussing this bill, which was passed on caution, the respondents, Stirling and Son, objected to the patent,—1*st*, That the substitution of lead in place of glass vessels was no new discovery, being only a small variation in the method of conducting the manufacture. 2*d*, That it could be no new discovery at the time of granting the patent, because the suspenders had carried on the manufacture in that method for twenty years preceding that period. 3*d*, That at the time the patent was granted, this method of manufacturing oil, or spirit of vitriol, in vessels of lead, was known to, and practised by, various other people both in *England* and *Scotland*. And, 4*th*, That the suspenders had not given such a description of their invention as was required by the patent, and that it was signed by Dr. Roebuck alone, and not by both the suspenders.

" On these allegations, and counter-averments by the suspenders, a proof, before answer, was allowed by the Lord Ordinary to the respondents, to prove that the making the oil of vitriol from a mixture of sulphur and saltpetre, in

* Godson on Patents, p. 32.

vessels of lead, was at the time and before the date of the letters patent, known to, and actually practised by others, than the suspenders.

"The proofs being concluded, the cause was taken to report upon memorials.

"Upon the evidence the following questions arose:—1*st*, Whether the respondents had proved that they knew and practised the mode of preparing oil of vitriol before the date of the patent. 2*d*, Whether before that period the same mode was known and practised by any other person in *Scotland*. And, 3*d*, Whether there was any evidence that before that time the same mode was known to, and practised by, any person in *England*.

"On advising the cause, the Court of this date* pronounced the following interlocutor:—'On report of the Lord Justice-Clerk, and having advised the proof and memorials, *hinc inde*, in respect it appears from the proof adduced that the art of making oil of vitriol from a mixture of sulphur and saltpetre in vessels of lead, was at the time, and before the date of the letters patent, in favour of the suspenders, (*i. e* appellants) known to, and actually practised by, different persons in England— therefore the Lords find the letters orderly proceeded, and decern.

"The case was brought by appeal to the House of Lords, where it appears that the respondents, Messrs. Stirling & Son, strenuously insisted upon the invention having been known in Scotland, as well as in England.

"The appeal was disposed of by the House of Lords, of this date.† The judgment was as follows:—'*Ordered* and *adjudged* that the said petition and appeal be dismissed, and that the said several interlocutors therein complained of, be, and the same are, hereby affirmed, *for other reasons*, as well as the reason specified therein.

"It will be observed, that in Roebuck's appeal, the attention of the House of Lords was not confined to the sole point depending for decision in the present case: viz. Whether the previous use in England of itself invalidated the patent; nor did their judgment necessarily depend upon the opinion entertained by the House upon that point.

"The whole case was brought before the House upon that appeal; and all the points that could be made in the case were raised, argued upon, and relied on to sustain or impeach the decision of the Court below; and it is submitted to be quite clear, that the decision of the Court below was capable of being supported, even if the reason given for that decision had been deemed erroneous.

"The evidence stated in the case shews that Stirling and Son § had been acquainted with the use of leaden vessels in the manufacture of vitriol, and had actually used them a considerable time before Roebuck and Garbett's patent was obtained. Thus *Alexander Copland* swore, 'that upon an invitation from himself, the respondent, *Andrew Stirling*, came to his the deponent's father's house in *Galloway* in the end of *May* 1770: That he there, in repeated conversations, disclosed his method of making oil of vitriol, and performed experiments with him, in order to confirm what he told him, but that, for want of convenience, he did not then shew him by experiment the process in leaden vessels so far as he could have wished, having only had one small leaden boiler, which was made use of at that time. And, being interrogated by the appellants, deposes, That it was some time in summer 1769, the deponent first made the volatile spirit of vitriol in leaden vessels, but did not concentrate it to the oil of vitriol till a short time before the date of the letter produced of the 11*th October* 1769; but the quantity of oil he made at that time did not exceed half an ounce: That after that experiment, the deponent did frequently make the spirit of vitriol to the extent of a gallon, or thereby; but that he did not afterwards take the trouble of concentrating it into oil, as thinking it unnecessary, the concentration of the oil of vitriol being a well-known process; and the whole of the process the deponent kept as secret as

* 10th March, 1774. † 27th May, 1774. § Appeal Case for Stirling & Son, page 4.

he could, and did not discover it to any body, except his brother, Mr. Kent, and the respondents. That the respondent, Mr. *Andrew Stirling*, was about a fortnight at the deponent's father's house, during which time the deponent did make a small quantity of the spirit of vitriol in presence of the said *Stirling*, but did not concentrate any of it into oil, not having the proper apparatus: And, being interrogated whether the Messrs. *Stirlings* applied to him for any farther information about the process for making the oil of vitriol after the said *Andrew Stirling* had returned from *Galloway*, deposes *negative*, *Andrew Stirling* having taken notes from the deponent's book of experiments before referred to, and likewise notes from the conversations between them.' This witness produced upon oath the following extracts from his book of experiments:—'Remarks for making oil of vitriol, that it keeps up all the metals when concentrated, and particularly lead, which it seems to act on then, whether hot or cold, but when diluted about one-fourth to three-fourths of water, it lets fall all the lead it had taken up in the form of a white powder. Hence leaden cisterns may be used for condensing the fumes and boiling down the liquor to the strength above mentioned, when (meaning after which) glass retorts must be used, &c.' 'It appears that the acid does not act upon the lead perceptibly till it is boiled so far down as to be equal parts of it and water; therefore it appears that the liquor may be boiled in lead always till there is two-thirds water to one-third acid, &c.' 'The above are selected out of a number more to the same purpose, all relating to the construction and management of leaden vessels for making oil of vitriol; and there are several drawings of leaden vessels for the same, and in the said book.'

"*John Wand* swore, 'That he has been servant to the respondents between three and four years, and that in the month of *February* or *March* 1771, he assisted at carrying a covered vessel from the ground story of the respondents' house up to the garret, which vessel, by the weight of it, he believed to be lead, and has seen the said vessel since that time: That at that time he bought about a pound weight of saltpetre by Mr. *Stirling's* order, and knows that some vitriol was made of the same, having heard Mr. *Stirling* say, that the said vitriol that was brought down was as good as any that had been made formerly, or that they had had formerly: That he is still engaged in the respondents' service in the works at *Marytown*, and knows that the lead vessel above mentioned, and which was formerly standing in Mr. *Stirling's* garret, was made use of at the said works: That he saw the vitriol above mentioned between the time that the vessel was carried up to the garret and the month of *May* thereafter, but cannot condescend more particularly upon the time.'

"'Besides this parole and written evidence,' (continues the statement in Stirling and Son's appeal case,) 'It is instructed, *rebus ipsis et factis*, that the respondents must have been in the knowledge of the use of vessels of lead in manufacturing oil of vitriol. For in *Matthie* the plumber's account, there are two pretty considerable articles for leaden vessels long before the date of the respondents' patent. The articles are:—

'1771.		c.	qr.	lb.		£.	s.	d.
Jan. 19.	To a lead vessel then at *Marytown*,	3	0	7,	28*s*.	4	5	9
—	To solder for ditto, ...	0	0	10,	14*d*.	0	11	8
— 29.	To a small round lead vessel, ..	0	0	21,	3*d*.	0	5	3

'These articles are over and above smaller ones, for which he swears he got ready money,' &c.

"The above evidence, which, in order to save the trouble of reference, has been quoted at large from the Appeal Cases, seems enough to have established the fact, that the invention claimed by Roebuck and Garbett, had been known, and to a certain extent practised by others *in Scotland*, before the date of their patent. This therefore, it may be inferred, was one of the grounds on which the judgment of the House of Lords proceeded.

"Besides this, it was in Roebuck's case admitted by the patentees themselves, that *they had practised the invention for many years, before applying for*

a patent—a fact which certainly deprived the invention of all pretensions to the character of *new* at the time that application was made, although in their petition they had positively stated it to be so. And that the circumstance referred to would have been, *per se*, a ground for annulling the patent, seems clear from the decision in the case of *Wood and Others* v. *Zimmer and Others*,* in which a patent was held void, where, previous to its being granted, the article had been publicly vended, *(though only for four months,)* by the patentee himself.

"The printed cases and reasons of appeal were accordingly prepared, so as not only to meet the view thrown out in the judgment of the Inner House, but to embrace the whole of the objections raised in the course of the pleadings in the Court below.

"From the circumstance of there being unfortunately no report of the proceedings of the case of Roebuck in the House of Lords, the appellant is unable to state, with certainty, what were 'the other Reasons' referred to in the judgment for affirming the decision of the Court of Session. Probably they were founded upon the facts, that the manufacture was known to and actually used by others, and by the patentees themselves, in Scotland, and the proceeds sold by the patentees for a long period previously to the grant of the patent.

"One thing is beyond doubt, that the House of Lords did not proceed singly on the ground specified in the interlocutor of the Court, viz., That the manufacture had been previously known and practised in England; and yet, if that ground had been considered sufficient to support the interlocutor under review, it is to be presumed that the appeal would have been disposed of by a simple judgment of affirmance. That, however, as already seen, was not the case.

"It thus appears, that the circumstances of the case of Roebuck differed essentially from those of the present—in which, the sole fact upon which the direction excepted against proceeds, is the previous use of the invention in England. The decision in that case, therefore, cannot be regarded as a precedent here. Accordingly, viewing the point at issue as one open to be dealt with on principle,—and holding it to be satisfactorily established, that there exists no communication or reciprocity, but, on the contrary, a complete distinction and separation between England and Scotland, as to rights of patent for new inventions,—the appellant confidently submits that it is impossible to support a ground of judgment, such as that excepted to, which rests necessarily and solely on the assumption, that the two parts of the United Kingdom are to be considered as but one jurisdiction, both in regard to the extent, and relative conditions, of grants of this nature.."

(Signed) BIGGS ANDREWS.
JAMES MILLER.

Having thus allowed the appellant to state his Reasons for objecting to the decision of the Court below, the same course will be pursued with the respondents; the following, therefore, were the respondents' 'Reasons' on which they maintained that the decision in their favour was correct.

RESPONDENTS' REASONS.

"*Because Evidence of the prior Public Use of a Manufacture or Machine in England, is admissible to establish the invalidity of a Patent in Scotland for the same Manufacture or Machine.*"

"The respondents humbly maintain this proposition on principle, as well as on the authority of an express judgment on the point by the Court of

* Holt's Cases, page 58.

Session in Scotland, which was affirmed by your Lordships' House.

"In the *first* place, with regard to the principles of law applicable to the question.

"There are two things to be kept in view, about which there is and can be no manner of dispute. The *first* is, that the appellant applied for and obtained his letters-patent *on a statement that he was the first and true inventor of his alleged improvements in the machinery for making paper;* and that his said improvement had *not been used* by any *other* person *at the time of making the letters-patent.* The *second* is, that the letters-patent contain the usual *proviso* that the patent shall be void whenever it does appear that the invention had been previously used and exercised, and was not a new invention by the appellant.

"Now, the respondents were in a situation to prove, at the trial, that the appellant's alleged invention, for which he obtained his patent, had been publicly used and practised at all and each of the different great paper-works condescended on by them in their 12th Statement of Facts. The appellant, however, conceded the fact of such prior public use in England, but contended that any evidence of such use was *irrelevant* to void a Scotch patent; that to Scotland, England, in questions of this sort, behoved to be regarded as still a foreign country, as much as France or America; that England and Scotland were still distinct and separate 'realms,' in the sense of the statute of James I., and, therefore, that no use, however extensively proved in England, could invalidate a Scotch patent, and *vice versa;* and this view of the matter was enforced on various grounds, which the respondents shall hereafter notice.

"It is proper, however, that they should premise, that, by the statute 21*st James I., ch.* 3, '*Concerning monopolies and dispensations with the penal laws, and the forfeitures thereof,*' it is declared, 'that all monopolies, *letters-patent* heretofore made or granted, or *hereafter made or to be granted,* for the sole buying, selling, making, working, or using, any thing *within this realm,* or the dominion of Wales, are contrary to the laws of this realm, and so are and shall be utterly *void and of none effect.*' But by *Section* 6, it is provided, declared, and enacted, 'That any declaration before mentioned, shall *not* extend to any letters-patent and grants of privilege for the term of fourteen years or under, *hereafter to be made,* of the sole working or making of any manner of new manufactures *within this realm, to the true and first inventor and inventors of such manufactures, which others, at the time of making such letters-patent and grants, shall not use;* so as also they be not contrary to the law, nor mischievous to the State, by raising prices of commodities at home, or hurt of trade, or generally inconvenient.' But by *Section* 10, letters-patent, made or to be made, conferring the exclusive privilege of printing any work, are expressly *excepted* from the operation of the Act.

"The power, therefore, which was reserved to the Sovereign of granting monopolies in time coming, was qualified with these *four* conditions:—1*st,* That it should only be extended to the working or making of *new manufactures within the realm;* 2*dly,* That the privilege should be granted to *none* but the *true and first inventors* of such manufactures; 3*dly,* That the *first* inventor should *not* be entitled to such letters-patent where *others* of his Majesty's subjects were, *at the time, in the use and practice of making such manufactures;* and 4*thly,* That letters-patent shall in no case be contrary to the law, nor mischievous to the State, by raising the prices of commodities at home, or hurt of trade, or generally inconvenient. In every case where letters-patent were unduly obtained, or came under any of these provisos, they were, by the previous general enactment, declared to be void and null.

"It is true that an invention may be learned by travel, or produced by study, and that in either case the intention of the legislature is fulfilled. But when a patent is sought for something which has been practised 'BEYOND THE SEA,' the applicant is required to affirm, '*that in* consequence of a certain communication from a *foreigner residing abroad,*' he is in possession of

a certain invention; and the fact so disclosed by him is then set forth in the title of the letters-patent. He must be the true and first inventor, and it is an express condition of such a patent, that *others of the lieges must not have used* his manufacture, otherwise the exclusive privilege is made void.

"In Scotland, a statute was passed in 1641, ch, 76,* which proceeds on the preamble of the hurt and prejudice sustained by the lieges, by certain monopolies used and exacted within the Kingdom; and, therefore, it ordains several patents, which are enumerated, *and all other patents, purchased or to be purchased, for the benefit of particular persons, in prejudice of the public, to cease and be ineffectual.*

This Scotch statute and the declaratory Act of King James, settled the law as to the extent of the Royal prerogative in this matter; and since the union of the two Kingdoms the same law, in regard to trade and patents, has prevailed in both. For by the *Sixth* Article of the *Treaty of Union*, it is expressly declared, 'That *all* PARTS *of the United Kingdom* for ever, from and after the Union, shall have *the same allowances, encouragements, and drawbacks*, and be under the same *prohibitions, restrictions, and regulations of trade*, and *liable* to the same customs and duties on import and export: And that the allowances, encouragements, and drawbacks, *prohibitions*, and *restrictions*, and *regulations of trade*, and the customs and duties on import and export, *settled in England when the Union commences*, SHALL, from and after the Union, *take place throughout the whole United Kingdom*.' And by the 25th Article it is enacted and declared, that all laws and statutes in either Kingdom, so far as they were contrary to the Articles of the Union, '*were to cease and become void.*'

"Thus there can now be no monopoly, in relation to trade in England, which would not operate also as a monopoly in relation to trade in Scotland. The laws regulating the trade of all 'Great Britain' are the same; and though, when exclusive privileges are granted by the Sovereign, within the limits assigned to the prerogative by statute, *the forms* necessary to be adopted in the two portions of the United Kingdom, may vary,—*the law is nevertheless the same in both.* And the prior use of a manufacture in any portion of the United Kingdom, must therefore render the exclusive privilege meant to be conferred by a patent, of no avail any where within the limits of the United Realm or Kingdom.

"Since the Union, there is but one *realm*—Great Britain,—one Sovereign to whom alone the subjects of Great Britain owe allegiance, though the oath of allegiance may, by law, still be administered before the ancient judicial tribunals of the two ancient Kingdoms. In all that relates to the encouragements, the prohibitions, *restrictions*, and *regulations* of trade, however, there is but *one law;* while, by the Treaty of Union, it is declared that the encouragements, as well as the prohibitions, restrictions, and regulations of trade, 'which were *settled in England* when the Union commenced, should, from and after the Union, take place throughout the *whole United Kingdom*.'

"And, therefore, the English statute of James I. concerning monopolies, is as much part and parcel of the law of Scotland, as the Act ratifying the Treaty of Union itself. It has been always so understood in Scotland. And consequently, the *declaration* that patents shall be effectual for fourteen years for making any new manufacture *within this realm*, to the first and true inventor of such manufacture, which others have not, at the time of granting the patent, used, must be read as applicable to the United Kingdom, or as if the words 'within Great Britain' were substituted for the words within the realm.

"A different interpretation of the law would lead to the most anomalous and injurious results. It cannot surely be maintained that every thing that is unknown in Scotland may be the subject of a patent here, however common the use of it may be in England. On one side of the Tweed a particular species of plough may have been very long in common use, while it

* Thomson's edition of the Statutes, Vol. V. p. 496.

was not in use at all on the other side. But would it be consistent, either with the spirit or letter of the Treaty of Union, that the lieges on both sides of the Tweed should not have the same *protection* in the use of the plough?

"England and Scotland are no longer foreign countries to each other, in any sense of the term. They are divided by no sea, and, in point of law as well as of fact, they are the United Realm of Great Britain. And therefore to maintain that a patent may be good in Scotland, and yet bad in England, is utterly destructive of the principles on which, by statute, the two Kingdoms were incorporated into one.

"But the appellant, in his argument in the Court below, seemed to rely on Scotland being considered as a *foreign country* in regard to England, in relation *to patents*, because of the fact that a patent which had passed the Seals in England, would not be good in Scotland, unless it passed the Seals in Scotland also, *et vice versa*.

"But to this observation there is an irresistible answer. By the Union of the two Kingdoms, *the English laws in force at the period of the Union, both* as to the *revenue and trade*, were *communicated to Scotland*. The communication of these laws was no difficult matter, while *the mode* of administering them, or any change in the Courts or peculiar forms by which they were administered, was a different and more difficult matter. The nature of the land rights of Scotland, and many other obstacles, rendered an *absolute* union of the two Kingdoms next to impossible. And therefore, while the whole United Kingdom was declared to be subject to the same encouragements, restrictions and regulations *of trade*, the existence of separate judicatories and forms was indispensable.

"While the 'United Kingdom' remains subject to the same limitations and encouragements of trade, how can that machine which has been, publicly and without restraint, for years used by the Queen's liege subjects in England, in the manufacture of paper, be made the subject of an *effectual monopoly* in Scotland? The question cannot be answered in the affirmative, without leading to the most unjust results to the lieges in one or other of the sections of the United Realm.

"With regard, again, to a patent passing a particular Seal for Scotland, and another Seal for England, that circumstance, with deference, affords no strength whatever to the appellant's case. It might as well have been said that the law regarding the revenue and trade in the two Kingdoms were different, because there were separate Courts of Exchequer, and separate Boards of Excise and Customs, and for Stamps and Taxes. But the law is, by the force of statute, declared to be the same in regard to patents on both sides of the Tweed. For the law relating to patents is only a part and parcel of the law by which the trade of the United Kingdom is *regulated*, *restrained*, or *encouraged*, though the *execution* of the law may be by means of different Courts in the two ends of the island.

"The matter of the patent is, the respondents believe, the only thing regarding trade where the Queen's Seals are necessary. And since it was requisite, and made a part and condition of the Union, that the Seals of the two sections of the United Kingdom should remain distinct, it is of course necessary to give a patent validity and force in both, that the Seals of both should be obtained. But it is equally certain, since the laws, regarding the prohibitions of trade, were declared to operate equally over the whole island, that he who is entitled to a patent for Scotland, is equally entitled to a patent for England; while, on the other hand, if there lie a good exception against it in the one section of the kingdom, he cannot obtain it in the other: For example, if the invention be disclosed and made public in *either* part of the United Kingdom before both patents are sealed, he could not avail himself of either. And accordingly, the respondents believe that, in practice, in order to enable the party to obtain a patent for both parts of the Kingdom, before his specification falls due under the English patent, and the necessity for the publication of the invention arises, the period for enrolling the specification in Chancery is enlarged.

"But a further conclusive argument against the appellant's proposition, that Scotland is considered as a *foreign country* as regards patents, is furnished by the fact, as well as the practice, of the Crown being at variance with such proposition. For a patent would not be granted upon the application of an individual *importing an invention from Scotland*, not even from a *foreigner* residing in Scotland—nor indeed from a native of Scotland residing in France, because he would not be a foreigner.

"Monopolies are adverse to the common law of Scotland as well as of England, and the grant thereof by the Sovereign can only be supported on clear evidence of *utility to the public*, or as a reward for the discovery of a perfectly new invention. But neither of these elements exist in the case of one who has wholesale imported the known public practice and use in any particular department in trade,—of Berwickshire, for example, into Northumberland, or of Cumberland into Dumfriesshire. The appellant admits, as matter *of fact*, the previous public use of his machine for manufacturing paper in England. About the fact there is no dispute, nor can there be any that the statute of James is part of the law of the United Kingdom, and that the law in relation to trade is the same in both. And therefore to hold, that the fact of prior public use in England of this invention, was not relevant and admissible as a ground for proving the invalidity of the appellant's patent, was in other words to say, that his patent was valid though it was not for a new manufacture—though he was not the first and true inventor—and though the manufacture had been in public use by others at the date of the patent, thereby treating as of no effect whatsoever the very qualities and conditions under which alone it is declared by statute, that the Sovereign may, in the exercise of the Royal prerogative, grant a valid patent or monopoly in a matter of trade.

"Suppose the case of admitted prior use of the manufacture in Scotland—the appellant conceded that evidence of that fact would not only have been relevant and admissible, but of conclusive effect against the validity of his patent. But on what ground is it that that fact, when established, would be conclusive against the monopoly? It is because *the lieges* had, before the letters-patent, and by the use at the time by others, a vested right in the *manufacture*. But under the statute of James and the Treaty of Union, is there to be any distinction of the rights of the Queen's liege subjects in matters of trade? Though there is but one Sovereign, one realm, and one allegiance—is it to a certain section of the Queen's lieges only that the vested right of freedom from monopoly applies, and not to others? How can such a doctrine be maintained with any regard to the fact of there being now but one realm, and one law in relation to matters of trade for all the lieges?

"The respondents therefore humbly submit, that, *on principle*, the judgment of Lord Mackenzie at the trial, supported as it was by the unanimous judgment of the First Division of the Court of Session, disallowing the exception taken to his Lordship's judgment, is well founded.

"But, in the *second* place, the judgments appealed from are supported by the authority of an express decision of the Court below, and of your Lordships' House, and which stands unopposed, so far as the respondents can learn, by any opposite authority or decision, either in England or Scotland. The case to which they refer is that of *Roebuck and Garbett* v. *William Stirling and Son*, 10*th March*, 1774. It is reported in *Brown's Supplement* to the Dictionary of Decisions, Vol. V. p. 522; and in *Lord Hailes' Collection of Decisions*, Vol. I., p. 566. The rubric of the case, as stated by Lord Hailes, is in these words,—'Found a *good objection* to a *Scotch patent*, that *previous to its being granted*, the art was known and practised *in England*.' The facts of the case were as follow:—

"*Dr. Roebuck* obtained, by letters-patent under the Great Seal of Scotland, the exclusive privilege of exercising the art of manufacturing oil of vitriol in vessels of lead, within Scotland, for fourteen years. *Stirling and Company* erected a vitriol-work at Glasgow for carrying on the *same process*, where-

upon *Roebuck* presented an application to the Court of Session for an interdict or injunction against Stirling and Company's using the process. After a variety of proceedings, which it is unnecessary to detail, *the injunction was granted* for stopping Stirling and Company's works, while in the mean time, the following questions were raised and discussed between the parties: *First,* Stirling and Company mantained that the invention claimed by Roebuck was no new discovery, being only a slight variation in the method of conducting the manufacture: *Secondly,* There could be no discovery, inasmuch as Roebuck and Company had themselves carried on the manufacture for twenty years previously: *Thirdly, That at the time the patent was granted, this method of manufacturing oil or spirit of vitriol in vessels of lead, was known to and practised by various other people, both in England and Scotland.*

"These averments were denied by Roebuck, who, on the other hand, averred that, prior to the date of the patent, the manufacture of the oil of vitriol in vessels of lead was *not* publicly practised by any person whatever, *either in England* or Scotland.

"The Lord Ordinary, after reporting the cause to the Court, pronounced the following interlocutor:* 'The Lord Ordinary, *after having advised with the Lords* and considered the condescendence for the chargers, with the answers thereto for the suspenders, and called the cause, *before Answer,* allows the chargers (*i. e.* respondents) to prove *pro ut de jure,* that the making the oil of vitriol from a mixture of sulphur and saltpetre in vessels of lead, *was at the time, and before the date of the letters-patent in favour of the suspenders,* (*i. e.* appellants,) *known to and actually practised by others than the suspenders themselves;* and allows the suspenders a conjunct probation thereanent, and grants commission to persons to be mutually named by parties' doers before extract, and failing such nomination, or in case the persons named do not accept or attend, to any of His Majesty's Justices of Peace, in the county of *Worcester* in England, to take the proof to be adduced by both parties at *Bewdley,* in said county, and to *Henry Davidson* and *John Spottiswoode,* solicitors-at-law, at *London,* or any of His Majesty's Justices of the Peace in the bounds, to take the proof to be adduced by both parties at *Battersea,* within three miles of *London;* and to any of His Majesty's Justices of the Peace in the bounds of *England,* to take the proof to be adduced by both parties,' &c.

"A commission was in terms of this interlocutor issued, and witnesses were examined both in England and in Scotland. And, the cause having been argued in full written pleadings, termed Memorials, the following interlocutor was pronounced:† 'On report of the Lord Justice-Clerk, and having advised the proof and memorials *hinc inde,* in respect it appears from the proof adduced, that the art of making the oil of vitriol from a mixture of sulphur and saltpetre, in vessels of lead, was *at the time and before the* date of the letters-patent, in favour of the suspenders (*i. e.* appellants) *known to and actually practised by different persons* IN ENGLAND; THEREFORE the Lords *find the letters orderly proceeded, and decern.*'

"The respondents have subjoined to this case the opinions delivered by the Judges,§ when the interlocutor, just recited, was pronounced, and to these opinions they now respectfully solicit the attention of your Lordships.

"It will be observed, that the interlocutor of 10th March, 1773, allowed to the parties a proof of their respective averments '*before answer,*' that is to say, before determining the *relevancy* and legal effect of the averments, and it was upon these points that the written argument was ordered and submitted to the Court below, after the proof had been concluded. And accordingly, by the final judgment of 10th March, 1774, their Lordships found, *first,* That the averment of Stirling and Company, as to the prior public use *in England,* was established; and *secondly,* That that fact was of itself *relevant and sufficient in law* to entitle the Court to find the letters orderly proceeded —that is, to dissolve the injunction which had been granted against the use of the manufacture by Stirling and Company.

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* March 10, 1773. † March 10, 1774. § Vide Appendix.

"Roebuck and Garbett brought the case under the review of your Lordships' House by Appeal, and in their Case they maintained the identical arguments which were maintained by the appellant in the Court below in this case, as to the irrelevancy and inadmissibility of any evidence of prior public use of a manufacture in England, to invalidate a patent for the same manufacture taken out in Scotland. On turning to the Appeal case for Roebuck and Garbett,* your Lordships will find that they founded on the fact that a patent under the Great Seal of England does not extend to Scotland, while it was quite common for a person to apply to have a patent taken in England extended to Scotland, in order to secure the advantage of the discovery in both countries—'*England and Scotland, in the eye of law, being foreign countries in this particular.*' 'Had the law stood otherwise, no useful *foreign* invention could ever have been introduced into this country; the law *of Scotland considers every place, not subject to the jurisdiction of its own courts, a foreign country*, and though the law, relative to patents, be the same in both parts of the United Kingdom, yet, in applying that law, *England* is considered a foreign country to *Scotland*. And in view of this distinction, as well as in conformity to the uniform practice, a clause is inserted in the present patent, that it shall be void when it does appear that the said invention, '*Quoad ejus publicum in illa parte dict. regni nostri Magnæ Britanniæ Scotia vocat. usum et exercitum non esse novam inventionem vel a dictis Doctore Roebuck et Samuele Garbett, ut predicitur non esse inventam vel excogitatam.*' 'So standing the law, the appellants contended, that they were entitled to enjoy the benefit of their patent, unless the respondents proved, that before the date of the patent the manufacture of oil or spirits of vitriol in lead was publicly *practised by others in Scotland*; that a private or clandestine manufacture in small quantities will not answer the purpose, because that invention, which is kept secret from the public, or is locked up in the breast of the inventor, is, so far as respects the public, no invention at all, and the man who first makes the art or invention public, is alone entitled from the State to the advantages accruing from it.'

"Then there follows an argument on the evidence of the fact of the previous use and practice of the manufacture in England, upon which neither the Court below nor your Lordships entertained any doubt whatever. And in their *second* reason of Appeal,† Roebuck and Garbett expressed themselves thus:—'No proof has been brought by the respondents, either of the discovery or practice,' by any other than the appellants, of this invention in *Scotland, (which alone can avail them)*; and with respect to the proof of the prior practice of the same mode in *England*, that proof, were it much stronger, and more unexceptionable than it is, cannot serve the respondents, *because England, in the present question, is to be considered as a foreign country with respect to Scotland, and, in that view, the appellants are entitled to the full benefit of the patent*, even though they had not been the first discoverers, *but only the first importers of the invention from England to Scotland.*' Such were the grounds on which an alteration of the judgment of the Court of Session was sought from your Lordships.

"On the other hand, Stirling and Company contended, that Dr. Roebuck's patent was void, on the grounds pleaded in the Court below, but more especially because, at the date of the letters-patent, and for a long time prior thereto, the particular manufacture was known to and had been publicly practised by others in England, and they founded on the *Sixth* Section of the Statute of King James as applicable to the *species facti* that there occurred—that Dr. Roebuck was not the true and first inventor of the manufacture—that it had been used by others within the realm, and therefore, since the Union of the two Kingdoms, (and they quoted the sixth article of the Treaty of Union,) the use and practice of the manufacture in England, was a use and practice within the Realm or Kingdom of Great Britain.

"The judgment pronounced by your Lordships' House is as follows:—

* P. 3. † Appeal Case, p. 5.

'*May 27th*, 1774. Ordered and adjudged, that the Appeal be dismissed, and that the interlocutors therein complained of be *affirmed*, for other reasons, *as well as the reasons specified therein*.'

"Now, the reason on which the judgment of the Court of Session proceeds, whereby the injunction against Stirling and Company was dissolved, and Roebuck's patent found void, is exclusively that it was proved that the art of making oil of vitriol from a mixture of sulphur and saltpetre, in vessels of lead, was at the time, and before the date of the letters-patent, in favour of the appellants, *known to and actually* practised by *different persons in England*; and while it was by your Lordships thought that the judgment might be supported on other grounds, as well as on the ratio assigned in the judgment itself, you, at the same time, *expressly affirmed the ratio therein assigned as well as the judgment*.

"It is scarcely possible to suppose a case more exactly in point to the present than *Roebuck* v. *Stirling*. It was argued by the most eminent counsel in Scotland, as well as at the bar of England; and, as has been already said, no adverse judgment of any of the Courts in either country has been discovered. On the contrary, the books are not without traces confirmatory of the law being settled as it is contended for by the respondents, as will be shewn immediately.

"In the course of the argument in the Court below, in Roebuck's case, reference was made to *Edgeberry* v. *Stephens*, *Saldkell's Reports*, vol. ii. p. 447. Saldkell's words are: 'A grant of monopoly may be to the first inventor by the 21st James I.; and if the invention be new in England, a patent may be granted, though the thing *was practised beyond seas before*; for the statute speaks of new manufactures within this realm; so that, if they be new here, it is within the statute; for the act intended to encourage new devices, useful to the kingdom, and whether learned by travel or by study, is the same thing. Agreed by *Holt* and *Pollexfen*, in the case of *Edgeberry and Stephens*.'

"But it is manifest that neither the words nor the spirit of the judgment in the case of *Edgeberry*, could apply to *Roebuck* v. *Stirling*, or to the present case. For it applied only to the importation into this country of an invention which had been practised *beyond seas* before, and was learnt by travel. But surely the appellant will not maintain that there is *a sea* between England and Scotland, or that, in the sense of the judgment in Edgeberry's case, England and Scotland are to each other foreign nations.

"On the other hand, in the pleadings in the Court below, for *Stirling and Company*, a case was referred to as having occurred in England, which went clearly to support the view taken of the law, both in the Court below and by your Lordship's House. It is the case of *Clark* v. *Laycock*, and was referred to by *Lord Gardenston* in one part of his opinion, as given in the Appendix.* His Lordship says: 'In *Clark* v. *Laycock*, decided in the King's Bench, Clark had a patent for *both* kingdoms. His patent for England was set aside on the evidence of *Scotch* witnesses, that the art *had been practised in Scotland* before the date of Clark's patent.' From the pleadings in the Court below, it appears that Clark had obtained a patent in common form, both for England and Scotland, for making leather snuff-boxes. Founding on the patent obtained in England, he brought an action in the Court of King's Bench against Laycock, for making snuff-boxes of the same kind, and consequently for infringing the patent. The cause was tried before *Lord Mansfield on 25th April*, 1766. Laycock's defence was, that the same manufacture of snuff-boxes had been known and practised *in Scotland* before the date of Clark's patent for England; and the fact having been proved by one Scotch witness, a verdict was returned for the defendant, with £70 of costs. The Judgment Roll in this cause is to be found amongst the Records which are now preserved in the Rolls' Chapel, under date Hilary Term 1766, No. 949, *et seq.*; and the judgment was carried into effect against Clark in Scotland, by a decree interponed by the Court of Session.

* App. p. 2.

"Furthermore, in the celebrated case of the *King* v. *Arkwright*,* where the patent was ultimately set aside on the ground of want of novelty, evidence was given among other instances of prior use, of the use of his machine *in Scotland*, without any exception or objection, that such evidence was irrevelant. In the case of *Tennant's Patent*,† the validity of which was tried by Lord Ellenborough, on the 23d of September, 1802, the patent was set aside mainly on the ground, that the secret of the invention was communicated to Mr. Tennant by a *chemist in Glasgow;* so that this last case is also a direct authority against the proposition, that the two countries stand in the relationship of foreign countries to each other, in reference to patents, inasmuch as had such been the case, Mr. Tennant would have been the first inventor, as in Edgeberry and Stevens.

"In numerous instances, Parliament, since the union of the two countries, has, in legislating upon patent rights, completely identified and recognized the United Kingdom as *one Realm*, and in accordance with the Articles of Union, has extended the terms of patents, by one statute for the United Kingdom in many cases, although the original grant was only taken for England, and the respondents refer to the several acts for amending the laws of patents, where the only difference in the enactments with reference to the two countries, arises out of their *different forms of proceeding*, not making any distinction in the extent of the rights and privileges of the lieges of either country.

"In conclusion, the respondents beg leave to make the following quotation from *Professor Bell's Commentaries*, '*on the Principles of Mercantile Jurisprudence*.' Having previously stated that, since the Union, the same law in regard to *patents* and *the royal prerogative* applies to both sections of the United Kingdom, he says, 'If one have discovered and brought into use what another has only discovered in his closet, the former is entitled to the patent without distinguishing who was the first inventor, or whether the merit of the discovery may not have been due to both. If one have *imported* a discovery *from abroad*, although he has no merit as a discoverer, he is, on the doctrine of the law of patent, entitled to the privilege. This is grounded on the words of the statute, which gives to the King the power of granting a privilege for any new manufactures *within the realm*.' Whether this would rule the case of a patent taken out in England, for an invention disclosed in a specification then recorded, but for which no patent was taken out in Scotland, may be doubted. It would rather appear that this would *be regarded as a publication within the realm*, and the manufacture as therefore *not new* within the realm, to the effect of barring a patent for the manufacture in Scotland. If so, it does not appear how either the original inventor or a stranger could, after such publication, apply for a Scottish patent. Accordingly, *in practice, this danger seems to be understood*, and provision made against it, by allowing a longer time for the specification, where it is intended to have a patent for both countries.'

(*Signed*) ROBERT WHIGHAM.

(*To be concluded in our next Number.*)

TYPE DISTRIBUTING AND COMPOSING MACHINES.

In this age of mechanical invention, there are few branches of the manufactures or arts, which may be considered safe from the revolutionizing hand of the ingenious mechanician, but had we been asked to point out one branch of industry less likely than another to be disturbed by the encroachments of machinery upon

* Davies's Patent Cases, p. 134 and † 429.

hand labor, we should certainly have mentioned the *compositor's art*,—as the speed obtained by the workman, in arranging type, seems scarcely possible to be exceeded by machinery, considering the delicacy of the movements and the mental qualifications required for composition.

The credit of being the first to attempt setting-up type by mechanical means, must be awarded to Dr. Church,* who patented his invention in the year 1822; since which date, many improvements have been effected, both in the distributing and arranging of typographical characters.

The last of these improvements was patented by Messrs. Clay and Rosenborg, in April last, and the specification was inrolled a few days since.

Having closely inspected these gentlemen's machinery, for distributing and composing type, whilst quiescent and in operation, we can pronounce a decided opinion as to the merits of the invention.

The distributing machine is a very simple contrivance.—The type for distribution is placed in a galley, and lowered from thence, line by line, into a sliding carriage, moved by hand, in which it is conveyed over proper apertures, leading to the receptacle where each separate type is to be deposited. The carriage is stopped over the aperture corresponding to the first letter in the line to be distributed, by raising a key; and at the same time that the carriage is arrested, a single type is pushed out by a small lever, into the aperture below. The type having descended to the bottom, is pushed, by revolving excentrics, along grooves or channels, formed in a metal table, from which it is removed, in separate lines or columns, to the composing-machine, when required.

The types are arranged in the composing-machine in vertical columns, on each side of a long narrow groove, cut in a metal plate, and are pushed out from the bottom of the columns on to a travelling endless band. This band runs along the narrow groove in the metal plate, by the depression of keys, similar to those in a piano-forte, which are connected to the pushers, and carries the type to a receiver, placed at one end of the machine,

* See Vol. VI., p. 225, of our First Series.

where they are piled or built up on a slider, so as to form lines. A very ingenious counting apparatus is applied to this part of the machine, for the purpose of indicating, by means of a dial in front—not the *number* of types in the receiver, but the *actual space* occupied by them, and consequently the space that requires filling up. When the line is completed, it is pushed out of the receiver into what is termed a justifying stick, where it is "read," and any errors corrected by an assistant compositor; after which, it is lowered into a galley.

It would be impossible to give more than a general notion of these machines, without the assistance of drawings; we have therefore confined ourselves to this hasty notice of their capabilities, and from the sometimes unwilling confession of printers, who have seen the machines at work, as to the practicability of *now* composing and distributing type by machinery, we should augur that a complete revolution in this branch of the arts, must inevitably take place.

The facility which the composing machine possesses, of delivering type into the receiver, is truly surprising. It has been proved, when the keys were played on at random, to clear out four hundred and fifty letters per minute, thus proving, that the capability of the machine's working, will be commensurate with the skill of the workman employed upon it.

Our reason for giving this early notice of the invention, is to bring immediately before the public an improvement which, we are convinced, will bear comparison in usefulness with any yet recorded in this work.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 220, Vol. XXI.)

"Results of a Trial of the Constant Indicator upon the Cornish Engine, at the East London Water-works."

By Professor Moseley, F.R.S., &c.

The object of this communication, is to exhibit and explain the results given by the author's Indicator, during a continuous

registration from the 28th January to the 25th February 1842, the engine during that time making 232,617 strokes. The numbers registered by the counter of the engine and the Indicator, were noted each morning and evening, and are recorded in a table appended to the paper. The differences between each two consecutive numbers registered by the counter, giving the number of strokes made between each two observations, are contained in one column of the table, and in another column are the differences between the successive registrations of the Indicator. These are followed by the mean registrations of the Indicator at every stroke of the engine, being the quotients of the numbers in the last-named column, divided by the corresponding numbers of the preceding column. The paper, after thus stating the numbers registered daily by the Indicator, during the period of trial, proceeds to explain the formula, to which they are to be applied, in order to determine the work done daily by the engine. The formula, when reduced from the general one, by the introduction of the numerical values of the constants dependant upon this engine, is—

$$U = 161.4474\,N - \cdot 09051\,L.$$

In this expression, U, represents the units of work (in lbs. raised one foot high) done upon each square inch of the piston through any given time, during which the number, registered by the Indicator, is represented by N, and the space in feet, which the piston traverses, by L. The second term of the formula, which is very small as compared with the first, is a correction, for the influence of the friction of the Indicator, on the number registered by it. The formula being then reduced by the substitution in it of the numerical values before alluded to, the whole number of units of work, per square inch, of the piston, done between the 28th January and the 25th February, is shown to have been 21,464,067·1727. From this is deduced the work done, during the same time, upon the whole area of the piston, as well as the duty done upon the piston for each cwt. of coals. These calculations are followed by a comparison of the results given by the Indicator, with those previously obtained from actual experiment, by Mr. Wicksteed; whence it appears, that with a necessary allowance for a difference in the lengths of stroke at

the periods of the two experiments, the results of the two are almost coincident. The work, per stroke, upon every square inch of the piston, as obtained by experiment, is 120·574, whilst, as shown by the Indicator, it is 119·338 lbs.

Professor Moseley exhibited the Indicator, and described its construction and action. It consists of two cylinders, each four inches long, communicating by pipes with the top and bottom of the cylinder of the steam-engine, to which the instrument is applied. In each of these cylinders there works a solid piston, four square inches in area; both being fixed upon the extremities of the same rod, which (when the Indicator is in action) sustains, in the direction of its length, a pressure equal to the difference between the pressures upon the two Indicator pistons, or equal to the effective pressures of the steam on four square inches of the piston of the engine. This pressure is made to bear upon a steel spring, connected by a link at each end with a similar spring, supported at its centre upon a projection from the frame of the instrument. The pressure of the piston-rod upon the lower spring, causes the two springs to separate from each other, and the separation produced is, by a well-known law of deflection, directly proportional to the pressure sustained, so long as the deflections are small. A peculiar form, first suggested, (it is believed) by M. Morin, is given to these springs; one surface of the spring is plane, and the opposite surface is of a parabolic form, by which equal strength is given throughout every portion of its length. In a spring, thus formed, the deflection is distributed more equally throughout, and being thus diminished for a given separation of the springs at every point, the elastic limits are nowhere so soon exceeded.

By this connexion of the piston-rod with the springs, its position is made to vary directly, as the effective pressure upon four square inches of the area of the piston of the steam-engine, so that every additional pound in that pressure, will cause the piston-rod to alter its position, by the same additional distance in the direction of its length.

A steel wheel, (termed the *integrating* wheel,) having the edge milled, turns upon the piston-rod as its axis, traversing with it also in the direction of its length. Through the arms of this wheel pass three rods, connected at their extremities by two pieces, so as to form with them a rigid frame, which turns, in fixed bearings, upon hollow axes, through which the piston-rod passes, so that the integrating wheel is free to traverse longitudinally upon the frame, but cannot revolve without carrying the frame with it. The integrating wheel is made to revolve by the rotation of a cone, which is held in contact with it by a spiral spring, acting constantly against the extremity of the axis of the cone. A system of bevil-wheels communicates to this cone the rotation of a pulley, which is driven by a cord carrying a weight at one extremity, and communicating by the other with the piston-rod of the engine, or with some point whose motion accords with it, but travelling through a less space. The circumference of the pulley moving precisely as the piston, the angle described by the cone, in any period of time, must be exactly in proportion to the space described by the piston in that time. The circumference of the integrating wheel, moving with that part of the cone with which it is in contact, the portion of a revolution, which it is made to describe in a given time, is dependent, first, upon the angle which the cone describes about its axis, during that time ; and secondly, upon the distance of its point of contact from the apex of the cone at that time. If either of these two elements of variation remained always the same, then the portion of a revolution, made by the wheel, would vary directly as the other ; whence it follows, by a well-known principle of variation, that when both these elements vary, it varies as their product ; or that the portion of a revolution, made by the integrating wheel in a given time, varies directly as the product of two factors, one of which is the angle described during that time by the cone, and the other the distance of the point of contact of the wheel and cone, from the apex of the cone. The former of these factors varies directly as the space described by the piston of the engine, and the latter as the effective pressure then exerted by the steam upon the pis-

ton: therefore the portion of a revolution made by the integrating wheel, varies as the product of the space described by the piston of the engine during a given time, by the effective pressure of the steam upon it during that time; that is, it varies as the work or dynamic effect of the steam upon the piston during that time; whence it follows, that the number of revolutions or parts of a revolution made by the integrating wheel, during the stroke, is proportional to the whole work, or dynamical effect of the steam upon the piston during the stroke.

By a train of toothed wheels, the number of revolutions of the integrating wheel is registered to five places of integers, and to one place of decimals. The number registered is not diminished by the backward motion of the cone during each return stroke, because the integrating wheel ascends to the apex of the cone, and remains there during each return stroke, so that no number is registered during that interval.

In order effectually to guard, however, against any error which might arise from this reversed motion of the piston, a combination of wheels has been introduced, by which the revolution of the cone can be arrested during the return stroke; and to adapt the instrument to register (if required) every stroke, a fourway cock has been constructed, by which one of the Indicator cylinders may be made to communicate always with the steam end of the steam-engine cylinder, and the other to be acted upon by the vacuum end: in this case the movement of the cone should be constantly forwards.

The Professor then gave the mathematical formula, by which the work is determined from the numbers registered by the Indicator. He then described the difference between the instrument and that of M. Morin, for applying the principle of M. Poncelet, to consist:

First.—In all those mechanical combinations which are peculiar to the instrument in its application to the steam-engine.—M. Morin's instrument having been applied to measure the traction of horses.

Secondly.—In the surface of a cone being substituted for the

plane surface of a circular disc; by which arrangement the rapidity of the changes of velocity, due to corresponding changes in the position of the integrating wheel, is diminshed in the same proportion in which the sine of one-half the angle of the cone is less than unity; and the force, necessary to drive the integrating wheel, being diminished in the same proportion, the chance of an error, arising from the slipping of the edge, of the integrating wheel, on the surface from which it receives the impulse, is lessened in proportion.

Thirdly.—In the separation of the registering apparatus from the integrating wheel; by which separation, whilst the springs are relieved from the effect of the momentum and the friction due to the weight of the registering apparatus, the latter being in a state of quiescence, the registration is legible whilst the Indicator is in action.

Fourthly.—In the variable position of the links connecting the springs together, by which variation the same series of deflexions may be obtained under different ranges of pressure.

In fact, that the Indicator has nothing in common with the "compteur" of M. Morin, except the principle of M. Poncelet, and the springs under a modified form.

The amount of the friction of the pistons was then examined, and the peculiar construction of their metallic packing explained. It was shown also, that instead of great difficulties arising from the friction of the integrating wheel upon the cone, or its slipping upon the surface, a very slight pressure of the spring produced sufficient adhesion to drive the registering apparatus. The Professor then explained the advantages resulting from a registration of the duty of steam-engines generally, not during the time of a few isolated experiments, as with the common Indicator, but extended over any given period, and through every stroke of the engine displaying all the changes which had occurred during that time;—with this view it had been decided, that the instrument should be attached to the engines of the Great Western steam-vessel, on her next voyage to America.

He then expressed his obligation to Mr. Wicksteed for the

facilities afforded him for the experiments at Old Ford, and paid a well-merited compliment to Mr. Holtzapffel for the excellent construction of the Indicator.

In reply to a question from Mr. Vignoles, he stated, that the instrument was not, under its present form, adapted to locomotive engines, but that a grant of £100. had been made by the British Association for the construction of such an instrument.

Mr. Cowper, in compliance with the request of Professor Moseley, illustrated his description by setting the instrument in motion, showing that the registration depended upon the revolutions of the integrating wheel: he demonstrated the cases of motion without pressure, and pressure without motion; in the former case, the integrating wheel being stationary at the apex of the cone, while revolving, does not receive any impulse from the contact with it, and therefore does not register; in the latter case, the surface of the cone, upon which the integrating wheel traverses, being at rest, does not communicate any rotative motion to it, and, consequently, no registration can take place; but when motion and pressure are combined, the cone revolving and the integrating wheel travelling from the apex some distance towards its base, the exact product of the motion of the cone, and the steam's pressure upon the piston, would be registered by the amount of the revolution of the integrating wheel.

Mr. Wicksteed observed, that every facility had been afforded to Professor Moseley for applying his new Indicator, for the purpose of ascertaining the duty performed by the Cornish engine, at Old Ford, but that he had not at all interfered with the experiments, being desirous of ascertaining whether the results would correspond with his trials. That after the work of the engine had been registered, while it was making about 179,000 strokes, the mean result, as stated by Professor Moseley, was so nearly that arrived at by Mr. Wicksteed, that he had no doubt of the accuracy of the machine, as a good indicator of the real duty performed by the engine, the difference, in the result of the mean pressure of the steam, deducting the vacuum, or 0·73 lb., was 0·12 lb., namely, according to Mr. Wicksteed's experiments

12·94 — 0·73 = 12·21 lbs., and according to Professor Moseley 12·09 lbs.; this difference might arise from a variation in the mean length of stroke during the two sets of experiments—from a slight variation in the point at which the steam had been cut off—from a variation in the level of the water in the pump well, or other practical causes,—the difference, however, was so insignificant, that he would rely on the accuracy of Professer Moseley's Indicator, and allow the possibility of a slight error in his own experiments.

Mr. Farey observed, that Professor Moseley's instrument must be influenced by variations in the length of stroke, for, whenever the piston makes a long stroke, the cone and the train of registering wheels, must be turned farther round, and would register a higher number than they would do in case of a shorter stroke, supposing the impelling force, exerted by the steam, to be always the same. If the instrument could be really made to give its results, according to the actual length of all the varying strokes made during the time of observation, by truly aggregating these varying lengths into one sum, the results would be free from the usual uncertainty respecting an average length of stroke.

In the monthly reports of engines in Cornwall, the performance is reckoned according to some reputed length of stroke, which had been fixed upon for each engine, when it was first reported; and it is afterwards assumed, that no departure from that reputed length has taken place, when, in fact, such departure does often occur.

It would be very desirable to have a moving card applied to the new instrument, in order to indicate the impelling force of the steam in the cylinder, by tracing curves on paper, like those by the ordinary indicators. This, it appeared, might be done, with the advantage of causing the paper, on which the curve is drawn, to travel onwards, and bring fresh paper into its place, so as to obtain a series of distinct curves for as many succeeding strokes.

The form of the springs of Professor Moseley's instrument would be a decided improvement, if substituted for the spiral

spring of ordinary Indicators. Mr. Farey had applied, to an ordinary Indicator, a mode of exhibiting, at a glance, whether the engine was exerting more or less force than its ordinary appointed task; the plan answered that purpose; but as it required the Indicator to be always in action, the spring of the Indicator broke, after working more than two days.—he therefore abandoned it. The springs in the new instrument were proved, by the trial at Old Ford, to be capable of enduring continual exertion without breaking.

The Professor had stated, that the scale of flexure of the new springs was found to be exactly, according to theory, equal divisions with equal forces; this might be expected, because the flexure of the springs was small, and the bending force acted in a direction nearly at right angles to the length of the springs. In ordinary Indicators, the scale should not always be equal divisions, because the wire of the spring, being wound spirally into a screw of small diameter, the spiral obliquity of the thread of such screw becomes more oblique to the direction of the bending force, as the spring is stretched, and less oblique as the spring is compressed; and hence the scale of pounds per square inch, by which the curve should be measured, for summing up the results, ought to be a scale of unequal divisions.

The Indicators, originally used by Boulton and Watt, were of a large size, with a long and powerful spring, curled into a cylindrical form, as large in diameter as could be included in the cylinder of the Indicator, and the motion allowed to the piston by the spring is very short; such Indicators were judiciously proportioned, and they do not show any sensible inequality of divisions in their scale. But recently, Indicators have been frequently made without the knowledge of their true principle, and the rules of proportion are not observed, so that it will sometimes be found, on actual trial of such instruments with weights, that their scale of pounds, per square inch, is not in equal divisions, although it is usual to employ a scale of equal divisions for summing up the curves traced by them.

In Boulton and Watt's Indicators, the scale of pounds, per

square inch, was formed from actual trial with weights, but such trials were made when the Indicator was cold, and dismounted from its place upon the steam-engine.

A much better mode, is to apply the weights, on the upper end of the piston-rod, when the Indicator is placed on the cylinder of the engine, while it is hot, its piston being supplied with the same quantity of oil, and the spring being in the same state as when it is in use. The depression of the piston, by the weights, is recorded by drawing a line, with the pencil of the instrument, on the cord itself, in the same manner as the usual atmospheric line is drawn thereon.

A series of lines, thus drawn with given weights, become so many original stages for subdividing between them, to form a true scale for summing up the curve described, under the same circumstances, and nearly at the same time.

Professor Moseley's instrument had two cylinders and pistons, operating in concert on the same piston-rod, and springs of peculiar construction to indicate the unbalanced pressure exerted by the steam, to impel the piston of the engine. The elastic force, wherewith the steam acts above the piston, (called the positive pressure or plenum,) is shown by a common Indicator, but the elastic force, wherewith the uncondensed steam is at the same time re-acting beneath the piston, (called the negative pressure or imperfect exhaustion or vacuum) is not shewn; hence the observations are limited to two odd halves of the stroke made by the piston; those halves being commonly the plenum during the descent, and the exhaustion during the ascent of the piston; it is taken for granted that the other two odd halves are the same as those which are observed, although such assumed parity is not always the true state of the case.

In the new instrument, the indication that it would make by drawing on a card, would be that of the difference subsisting between the plenum above, and the exhaustion beneath the piston of the engine, during its descent and ascent; wherefore it would indicate on one card as much as two ordinary indicators can do on two cards, if they are applied one to the top and the other to

the bottom of the cylinder of the steam-engine; in that case, each Indicator shews on its own card what the elastic force of the steam is during the plenum, and what it is during the exhaustion, but the required result, (which is the difference between the two,) must be obtained by combining together in the computation, those distinct curved lines which are drawn on two separate cards. Professor Moseley's combined indicator pistons, acting on the same springs, would at once indicate such difference, by the curve which it would trace on the one card.

In answer to a question from Mr. Parkes, as to whether the new instrument had been put to any other test than its apparent agreement with Mr. Wicksteed's estimate of the resistance overcome; and whether the common Indicator had been applied to the engine at the same time,—Professor Moseley said, that he had not compared the instrument with any other, but had subjected Mr. Wicksteed's calculations to a rigid investigation, and felt quite satisfied that they approximated closely to the truth.—He relied upon them as corroborations of the accuracy of the instrument.

Mr. Parkes observed, that it would have been more satisfactory to engineers to have been assured that every means had been taken to demonstrate the truth of the results recorded by an instrument which had such important functions in view. He wished to know in what manner the pressures denoted, had been ascertained,—whether by weights or by comparing them with a mercurial column. He had found the latter mode more exact than weights, in verifying the scale of the common Indicator, as the instrument being heated, was then in precisely the same state as when it was in use. He had found that a certain amount of correction was frequently necessary, as both the spring and the amount of piston friction were affected by heat.

Professor Moseley replied, that the instrument had not been compared with the mercurial column, but that the resistance of the springs, and the friction of the piston and instrument generally, had been ascertained by very accurate experiments, so that he had full confidence in the results.

Mr. Parkes said, that notwithstanding the respect and defer-

ence he felt for Professor Moseley's attainments and ingenuity, his past experience would not permit him to place entire confidence in the results afforded by the instrument: indeed he considered them to be altogether fallacious as representing the force acting on the piston of the Old Ford engine. He could not admit that the apparent near identity between Mr. Wicksteed's computations of resistance, and the constant indicator's registration of force, amounted to proof of the instrument's accuracy; for, it seemed to him that Mr. Wicksteed had omitted to take into account one important item of force, without the exertion of which, a piston could not be brought from a state of rest into a state of motion. He referred to the force required to give velocity to the piston. Mr. Wicksteed had weighed the greater part of that resistance which might be called ponderable, and had estimated the remainder, assigning about 12 lbs. per square inch on the piston as the total amount, after deducting the resistance to the piston's descent, arising from uncondensed steam. Thus, an elastic force of 12 lbs. on the piston would counterpoise a resistance of 12 lbs., but motion would not ensue until a superior force were applied. Considering the number of strokes made by this engine per minute, Mr. Parkes could not estimate the velocity of the piston at less than from 300 to 400 feet per minute, which was very great for this enormous mass, and would require the exertion of proportionate power. He regarded the piston of the engine, loaded with 12 lbs. per square inch, as he would a ball of 12 lbs. weight in a gun, balanced by a fluid of a corresponding elastic force; but such ball would remain motionless unless it were propelled by some additional force. This state of things had been denominated by Professor Barlow "the preparation for motion." Now as Mr. Wicksteed's estimate proceeded no further than the production of this state of things, and as Professor Moseley's constant Indicator recorded the mean pressure of the steam in the cylinder as barely equal to it, he could not assent to the accuracy of either method of determining the total resistance overcome by the steam.

Mr. Parkes would cite the experience of others as to the quantity of force actually expended in giving velocity in a Cornish

engine, over and above that necessary to balance the weight at the opposite end of the beam, friction, &c., included. In the fifth part of vol. iii. Trans. Inst. C. E., Mr. Enys has reported some experiments made, at Mr. Parkes' suggestion, on several engines. He would cite those of the Tresavean, as the cylinder was of the same diameter as the one at Old Ford, viz., 85 inches. The water load was equivalent to 12 lbs. per square inch on the steam piston, and when about half the usual velocity was given to the piston in the in-door stroke, a pressure of about 17½ lbs. was denoted throughout the stroke, by a mercurial column connected with the cylinder. Mr. Loam had since transmitted to him the following abstract of experiments made on the same engine, January 28, 1842. " Two indicators were used at the same time, and an open mercurial gauge. The engine was held in-doors until the mercury became stationary, in order to ascertain the *minimum* quantity of steam power necessary to produce motion. The pressure was 15 lbs. per square inch, when the water load was 12 lbs.

Here, then, a force of 3 lbs. was found requisite to establish an equilibrium between the power and resistance; and a further force of 2½ lbs. per square inch was necessary in order to urge the mass at about half of its ordinary velocity. Mr. Enys stated that less pressure was exhibited when the engine was brought in slower, and *vice versa;* and this was consistent with everyday experience.

Now, though the Old Ford engine had not to overcome so much frictional resistance as a deep mine engine, yet, having a weight to raise, according to Mr. Wicksteed, alone equal to 11·8 lbs. per square inch on the piston, Mr. Parkes was of opinion that this could not be effected at the usual working velocity, with less than 14 or 15 lbs. pressure of steam per square inch. He would suggest to Mr. Wicksteed to repeat Messrs. Enys and Loam's experiments, and also to work his engine with steam reduced nearly to such pressure in the boiler as would barely suffice to bring the piston down. Such experiments would confirm or invalidate the results given by Professor Moseley's instrument, and probably lead to the discovery of its imperfections, should any exist.

It appeared that Mr. Wicksteed conceived a greater amount of elastic force to be required to perform a stroke in proportion to the degree of expansion given to the steam in the cylinder. He would quote the pressures deduced by Mr. Wicksteed under five cases of expansion, as they exhibited some curious anomalies. They were taken from Table VI. of Mr. Wicksteed's Treatise. According to his table, when the steam was stopped at 6 feet of the stroke, the mean force exerted during the stroke of 10 feet, was 13 lbs. per square inch; at $4\frac{3}{4}$ feet, $13\frac{1}{2}$ lbs.; at 4 feet, $14\frac{3}{4}$ lbs.; at $3\frac{1}{2}$ feet, $15\frac{4}{10}$ lbs.; and at $3\frac{1}{10}$ feet, $15\frac{1}{2}$ lbs. It must be observed, that in every one of these cases, the resistance, as appreciated by Mr. Wicksteed, amounting to 13 lbs. per square inch, was a constant quantity; so that for some unexplained reason, an invariable load appeared to require a variable force to overcome it; a sliding scale of power, given as the measure of a constant resistance. It was possible that some small difference might have existed in the velocity of the stroke, in these cases; it was also possible that some error existed in the method used for determining the pressures, or in the evaporative quantities. However this might be, it was clear there was an error somewhere, as it could not be granted that an effect, deemed constant in all these cases, could require a varying cause for its production.

As these appreciations differed widely from each other, and still more so from the indications of Professor Moseley's instrument, Mr. Parkes hoped that Mr. Wicksteed would re-consider and verify this part of the subject. In corroboration of his opinion that the acting force recorded by the instrument, is too low, he would draw attention to the circumstance that, during the period of its application (twenty-eight days), the duty performed by the engine for each 94 lbs. of coal, amounted only to about $68\frac{1}{3}$ millions, and it would not be unreasonable to expect that at least 150 millions should have been the result under the different circumstances of mine and water-works engines, as 100 millions had been performed for some months by mine engines under a water-load equal to 12 lbs., and a mean steam pressure of 18 lbs. per square inch of the piston. Whereas, if the water-load of 11 lbs. at Old Ford, was overcome by an amount of force little

exceeding 12 lbs. per square inch, a proportionate increase of duty ought to have resulted, but such was not the case.

Mr. Parkes then proceeded to comment on the phrase "effective power," which he understood from Professor Moseley as significant of the force of the steam, or piston pressure, measured by his instrument. He thought that phrase more strictly applicable to the amount of power given off by the engine, when ascertained, as it might be in the case of pumping-engines, by the weight raised; or as it could only be determined on rotative engines, driving machinery, by a dynamometer applied at the extremity of the crank shaft. He would illustrate this by an example:—There was at Birmingham a corn-mill belonging to Mr. Lucy, worked by an excellent engine of forty horses power, made by Messrs. Boulton and Watt. This engine had a fly-wheel weighing 24 tons, and nine pairs of stones were driven, besides dressing machines. Mr. Lucy had taken out a patent for an apparatus as a substitute for the fly-wheel, which had been removed. The engine, so altered, now drives ten pairs of stones, under the same pressure of steam, and with the same consumption of fuel as before. Thus, what he should denominate the "effective power" of the engine, was increased, by this simple change, eleven per cent. Yet, Professor Moseley's instrument, or any other indicator, would have exhibited, both before and after the alteration, the exertion of a precisely equal force on the piston.

Neither did the Professor's instrument register the *absolute*, or what Professor Whewell had denominated the "*labouring*" force of the steam on the piston of an engine, as it made no deduction of the amount of force, whatever it might be, which was necessarily expended in overcoming the resistance opposed by the uncondensed steam. Its construction permitted it only to record the difference of these amounts. For these reasons he could not regard the instrument as likely, even when made trustworthy, to become of that utility to engineers which was the Professor's aim and hope. There was a greater need of an accurate dynamometer, capable of showing the effective power of an engine, whilst in regular work, and he was happy to say, that this desideratum had

been supplied by Mr. Davies, of Birmingham, by whose permission he would take an early opportunity of describing to the Institution the construction and efficacy of the instrument.

It was very important that a self-registering machine should be made, capable of recording the mean steam pressure operating throughout a stroke of the engine, but it was still more important that this registration should be accurate; and he hoped that the remarks which had been made would only urge Professor Moseley to further investigations, and induce him to enlarge as much as possible the useful powers of the instrument.

Professor Moseley observed, that when a body passes from a state of rest, through a state of motion, and into a state of rest again; or from a state of motion, at a given velocity, through a state of motion, at a different velocity, and back to its first velocity again; then is the work, which must be done upon it by the moving power, the same in amount, whatever may have been the velocity thus intervening between the two states of rest or of equal motion of the body, provided that the resistance opposed to its motion, and the space through which that resistance is overcome, be, in all cases, the same.

In Mr. Wicksteed's engine, the resistance thus opposed to the motion of the piston, and the space through which that resistance is overcome at every stroke, are thus constantly the same, (or in other words, the work done upon the resistance is the same at every stroke of the engine,) and the piston passes, at every stroke, from a state of rest to a state of rest again: it follows, therefore, by the above well-known principle of "*vis viva*," that the work done by the steam, as the moving power upon the piston of the engine, whilst it completes a stroke, is the same, whatever may be the velocity communicated to it, and to the mass which it carries with it, at any period of the stroke.

It is true, that to put the piston, and the mass carried along with it, at first in motion, a pressure greater than the resistance is required, and therefore greater than the mean pressure necessary to complete the stroke: a pressure equal to the resistance would only bring it into the state of rest bordering upon motion; to cause it to pass from this state of rest to a state of motion,

more pressure is required; and the more as the velocity to be acquired, whilst it moves through a given space, is greater—or in other words, in order to communicate any given velocity to a body whilst it moves through any space, there must be an excess of the work done by the driving pressure through that space, over that expended upon the resistance through that space; but all this excess is accumulated, and unless the steam pressure be afterwards made less than the resistance, or unless the steam be afterwards expanded through a distance dependent on the amount of this accumulated work, so that it may expend itself in overcoming the surplus resistance through that space, then the piston will strike upon the cylinder bottom.

This principle may be illustrated by an example: Suppose that the load upon the piston of an engine is 10 lbs. per square inch, and that the steam is admitted at a pressure of 15 lbs, it is evident that, by reason of the excess of 5 lbs. pressure of the steam above the load, the velocity of the piston will be made continually to increase until the steam is cut off, and afterwards, so long as the steam pressure exceeds the load, or until by its expansion the steam pressure is reduced to 10 lbs. per square inch. Up to this point the velocity of the piston and of the mass moving with it, will continually have been increasing, a great momentum will therefore have been acquired by it, and this momentum will carry it on to the completion of the stroke; although, after this position is passed, the steam pressure will be less than the load, and would by itself be insufficient to move it.

In other words, the work done by the steam upon the piston will have continually exceeded that expended on the load up to this period of the stroke, and the surplus will have been accumulated in the moving mass, which surplus work will carry on the piston to the end of the stroke, when a cylinder full of steam will be delivered, of greatly less pressure than the load. If the steam had been worked at full pressure, it is evident, that at every stroke a cylinder full of steam would have been discharged, of the same pressure as the load. In this consists, therefore, the advantage of working expansively.

It is evident, that the piston acquires its maximum velocity at

the point where the steam-pressure becomes equal to the load, and that the engineer, by the manipulation of the steam-valves, produces that adjustment by which the velocity, acquired by the piston at this point, (or the work then accumulated in it,) is caused to be just sufficient to carry on the piston to the end of the stroke, but without striking the cylinder-bottom: it is moreover evident, that the greater this maximum velocity can be made, the farther the piston will be carried beyond the point where the steam-pressure is equal to the load, and the less will be the pressure of the cylinder, full of steam, discharged at the completion of every stroke, or the greater the economy of the steam power.

A second illustration of the same principle may be drawn from the effect produced by a pressure suddenly thrown upon a spring. Suppose a spring which would rest deflected through an inch under a pressure of one pound.—If, when this spring is in an undeflected state, this pressure of one pound be suddenly thrown upon it, it is certain that the spring will, at first, deflect considerably beyond that distance of one inch, in which its deflection will eventually, after many oscillations, terminate. In fact, if it is thrown on with mathematical suddenness, the first deflection will be two inches. To explain this, let the pound weight be supposed to be applied gradually to the spring, by dropping grain after grain of sand slowly upon it. The spring will then evidently be brought to its deflection, without ever passing it. Now let it be observed, that on this supposition, the first grain of sand only will have descended through one inch, the next descending through less than an inch, the next through yet less, and so on. Thus the work done upon the spring, by each succeeding grain, will be less than that done by the preceding. Yet the aggregate work done by these successive small pressures, each working through a different space, is sufficient to deflect the spring one inch. Now let all the grains be placed at once upon the spring.—When it has deflected an inch, each grain will then have worked through an inch, and a great deal more work will, on the whole, have been done on the spring than before, indeed twice as much: but the work done before was enough to deflect the spring an inch; more than enough to deflect it has

now therefore been done: that is, more has been done than has been expended. The remainder is accumulated in the moving mass of the sand and the spring, and carries on the deflection greatly beyond the position of equilibrium.

The Indicator was placed upon the engine of the East London Water-works, in the belief that, by the experiments of Mr. Wicksteed, the work actually performed by that engine, was better known than that of any other. All the calculations and enquiries which have since been made, have fully confirmed that opinion. And he had full confidence in that verification of the registration of the Indicator, which is supplied by its agreement with Mr. Wicksteed's estimate of the work of his engine.

In reference to the use of the term "work," Professor Moseley stated, that the various terms used by foreign engineers, to convey the idea attached to that term, appeared at length to have resolved themselves into the single term "travail;" and that of the variety of corresponding terms, used in England, the term "work" was probably the most obvious translation of "travail;" that it moreover appeared to him the simplest, and the most intelligible; and that on these grounds he had adopted it.

In answer to the observation made by Mr. Parkes, suggesting the construction of an Indicator which would register the work of the machine at the point where it is applied, instead of at the cylinder of the engine,—

Professor Moseley stated, that such an instrument would undoubtedly be very valuable, especially if it could be made to register correctly the work transmitted by a rotating shaft: but that for the purpose comtemplated by him it would be entirely useless;—this object was to effect, in respect to ordinary engines working under constantly variable pressures, that constant registration of the duty, the introduction and publication of which had led to so remarkable an economy of steam power in the working of the Cornish engines. No registration of the work done at the working points of the machine, driven by the engine, would supply a fair estimate of the duty done by the engine, a greater or less portion of the work done by the engine being lost by reason of friction in its transfer through the machine, from its

driving to its working points, according as there was a greater or less complication of moving parts and rubbing surfaces intervening.

He repeated, that his object had been to determine the working qualities of the engine itself; and that he had, for this reason, specially sought to eliminate from his estimate those very influences of the friction of the machine driven by the engine, which Mr. Parkes thought it so important to include in it. It would have been a fault of his Indicator (for the purpose contemplated by it) if it had taken any notice of the effect of that change made in the machinery of Mr. Lucy's mill, which Mr. Parkes had spoken of. He had used the term *effective* work (not effective power) of the engine, to signify that excess of the work of the steam on one side of the piston, over that opposed to it, by the imperfectly condensed steam on the other, which it was necessary to know, in order to estimate the real duty of the engine. It was solely for the determination of that duty, that the Indicator had been constructed, and the alterations which Mr. Parkes had suggested, would have subjected its registration to influences which, in reference to that purpose, he had specially sought to eliminate.

[*To be continued.*

List of Patents

That have passed the Great Seal of IRELAND, from the 17*th September to the* 18*th of October*, 1842, *inclusive.*

To Charles Augustus Preller, of 16, East Cheap, in the city of London, merchant, for improvements in machinery for preparing, combing, and drawing wool and goats' hair,—being a communication from a certain foreigner, residing abroad.—Sealed 30th September.

William Geeves, of Old Cavendish-street, in the county of Middlesex, Gent., for certain improvements in machinery for cutting cork.—Sealed 30th September.

William Henry Kempton, of South-street, Pentonville, in the county of Middlesex, Gent., for improvements in the manufacture of candles.—Sealed 30th September.

Alexander Johnston, of Hill House, in the county of Edinburgh,

Esq., for certain improvements in carriages, which may also be applied to ships, boats, and various other purposes, where locomotion is required.—Sealed 3rd October.

William Baker, of Grosvenor-street, Grosvenor-square, in the county of Middlesex, surgeon, for certain improvements in the manufacture of boots and shoes.—Sealed 4th October.

John Anthony Tielens, of Fenchurch-street, in the city of London, merchant, for improvements in machinery or apparatus for knitting,—being a communication from a certain foreigner, residing abroad.—Sealed 8th October.

Thomas Banks, of Manchester, in the county of Lancaster, engineer, for certain improvements in the construction of wheels and tyres of wheels, to be employed upon railways.—Sealed 8th October.

William Revell Vigers, of Russell-square, in the county of Middlesex, Esq., for a mode of keeping the air in confined places in a pure or respirable state, to enable persons to remain or work under water, and in other places, without a constant supply of fresh atmospheric air,—being a communication from a certain foreigner, residing abroad.—Sealed 8th October.

Eugene de Varroc, of Bryanston-street, Portman-square, in the county of Middlesex, Gent., for an apparatus to be applied to chimnies to prevent them taking fire, and for rendering sweeping chimnies unnecessary.—Sealed 8th October.

Thomas Bell, of St. Austell, in the county of Cornwall, mine agent, for improvements in the manufacture of copper.—Sealed 8th October.

Julius Seybell, of 11, Golden-square, in the county of Middlesex, manufacturing chemist, for certain improvements in the manufacture of sulphate of soda and chlorine.—Sealed 8th October.

Isham Baggs, of Wharton-street, in the county of Middlesex, chemist, for improvements in obtaining motive power, by means of carbonic acid.—Sealed 8th October.

Thomas Marsden, of Salford, in the county of Lancaster, machine maker, and Solomon Robinson, of the same place, flax dresser, for improvements in machinery for dressing or heckling flax or hemp.—Sealed 8th October.

James Whitelaw, of Glasgow, in the county of Lanark, engineer, and James Sterreit, of Paisley, in the county of Renfrew, manufacturers, for improvements in rotary machines, to be worked by water.—Sealed 18th October.

List of Patents

Granted for SCOTLAND, subsequent to September 22nd, 1842.

To Charles William Firchild, of Wesley Park, Worcestershire, for an improved propelling apparatus for marine and other purposes.—Sealed 26th September.

Edwin Ward Trent, of Old Ford, Bow, London, rope-maker, for an improved mode of preparing oakum and other fibrous substances, for caulking ships and other vessels.—Sealed 29th September.

Peter Kagenbusch, of Wetter on Rhur, in Westphalia, in the Kingdom of Prussia, dyer, now residing in the parish of Lythe, Yorkshire, for certain improvements in the treatment of the alum rock or schist, and in the manufacture and application of the products derived therefrom.—Sealed 29th September.

Henry Bewley, of Dublin, licentiate apothecary and chemist, for an improved Chalybeate water.—Sealed 4th October.

Alfred Jefferey, of Lloyd-street, Pentonville, London, for a new method of preparing masts, spars, and other wood, for shipbuilding and other purposes.—Sealed 18th October.

Claude Edward Deutsche, of Fricour's Hotel, St. Martin's-lane, London, for improvements in combining materials to be used for cementing purposes, and for preventing the passage of fluids, and also for forming articles from such composition of materials, —being a communication.—Sealed 18th October.

John Ridsdale, of Leeds, for improvements in preparing fibrous materials for weaving, and in sizing warps.—Sealed 20th October.

Samuel Carson, of York-street, Covent Garden, London, for improvements in purifying and preserving animal substances.—Sealed 20th October.

Henry Brown, of Selkirk, and Thomas Walker, of the same place both manufacturers, for improvements on woollen carding engines.—Sealed 20th October.

Alphonse de Troisbrioux, of Great Russell-street, Bloomsbury, London, for improvements in lithographic and other printing presses,—being a communication from abroad.—Sealed 20th October.

New Patents
SEALED IN ENGLAND.
1842.

To Edward Bell, of the College of Civil Engineers, Putney, Professor of Practical Mechanics, for improvements in applying heat in the manufacture of artificial fuel, which improvements are applicable to the preparation of asphalte, and for other purposes.—Sealed 29th September—6 months for inrolment.

Samuel Henson, of New City Chambers, Bishopsgate-street, engineer, for certain improvements in locomotive apparatus, and in machinery for conveying letters, goods, and passengers, from place to place through the air, part of which improvements are applicable to locomotive and other machinery, to be used on water, or on land.—Sealed 29th September—6 months for inrolment.

William Smith, of Grosvenor-street, Camberwell, Gent., for improvements in treating certain animal matters, to obtain products, applicable to the manufacture of candles and other purposes.—Sealed 29th September—6 months for inrolment.

John Rand, of Howland-street, Fitzroy-square, artist, for improvements in making and closing metallic collapsable vessels.—Sealed 29th September—6 months for inrolment.

James Hyde, of Duckinfield, Cheshire, machine-maker, and John Hyde, of the same place, cotton spinner and manufacturer, for a certain improvement or improvements in the machinery used for preparing cotton, wool, silk, flax, and similar fibrous materials for spinning.—Sealed 29th September—6 months for inrolment.

John Ridsdale, of Leeds, in the county of York, for improvements in preparing fibrous materials for weaving, and in sizing warps.—Sealed 29th September—6 months for inrolment.

John Fry Wilkey, of Mount Vernon, St. Leonard, Exeter, commission agent, for improvements in carriages.—Sealed 29th September—6 months for inrolment.

John George Shipley, of Bruton-street, Berkeley-square, saddler, for certain improvements in saddles.—Sealed 6th October—6 months for inrolment.

John Oliver York, of Upper Coleshill-street, Eaton-square, in the county of Middlesex, engineer, for improvements in the manufacture of axles for railway wheels.—Sealed 8th October—6 months for inrolment.

Wilton George Turner, of Gateshead, Durham, Doctor of Philosophy, for improvements in the manufacture of alum.—Sealed 8th October—6 months for inrolment.

Claude Edward Deutsche, of Fricour's Hotel, St. Martin's-lane, for improvements in combining materials to be used for cementing purposes, and for preventing the passage of fluids; and also for forming or constructing articles from such compositions of materials,—being a communication.—Sealed 8th October—6 months for inrolment.

Samuel Dotchin, of Myrtle-street, Hoxton, jeweller, for improvements in paving, or covering and constructing roads, ways, and other surfaces,—being a communication from his son, lately deceased.—Sealed 8th October—6 months for inrolment.

Charles Thomas Holcombe, of Valentines, near Ilford, Essex, Esq., for an improved mode of using certain materials as fuel; also an apparatus or method for collecting the smoke or soot arising from the combustion of such fuel, which apparatus or method is applicable to collecting the smoke or soot arising from the ordinary combustion of fuel; and also the application of the products arising from the combustion of the first mentioned materials as a manure, and for other useful purposes.—Sealed 13th October—6months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, patent agent, for certain improvements in the manufacture of artificial fuel,—being a communication.—Sealed 13th October—6 months for inrolment.

Robert William Sievier, of Henrietta-street, Cavendish-square, Gent., for certain improvements in looms for weaving, and in the mode or method of producing plain or figured goods or fabrics.—Sealed 13th October—6 months for inrolment.

Peter Kagenbusch, of Lythe, in the county of York, for certain improvements in the treatment of the alum rock or schist, and in the manufacture and application of the products derived therefrom.—Sealed 13th October—6 months for inrolment.

Henry Brown, of Selkirk, manufacturer, and Thomas Walker, of the same place, manufacturer, for improvements on woollen carding engines.—Sealed 20th Oct.—6 months for inrolment.

Thomas Seville, of Royton, Lancashire, cotton spinner, for certain improvements in machinery used in the preparing and spinning of cotton, flax, and other fibrous substances.—Sealed 20th October—6 months for inrolment.

John Palmer Budd, of Ystalyfern Iron Works, Swansea, merchant, for improvements in the manufacture of iron.—Sealed 20th October—6 months for inrolment.

William Longmaid, of Plymouth, accountant, for improvements in treating ores and other minerals, and in obtaining various products therefrom, certain parts of which improvements are applicable to the manufacture of alkali.—Sealed 20th October—6 months for inrolment.

James Statham, of West-street, St. Giles', Venetian lock maker, for improvements in the construction of locks for Venetian blinds, used in carriages.—Sealed 20th October—6 months for inrolment.

Gilbert Claude Alzard, of Tichborne-street, Gent., for certain improvements in bread, biscuits, macaroni, vermicelli, and pastry, and in the mode of making the same.—Sealed 20th October—6 months for inrolment.

George Hazeldine, of Lant-street, Southwark, coach manufacturer, for certain improvements in omnibuses.—Sealed 27th October—6 months for inrolment.

James Gardner, of Banbury, ironmonger, for improvements in cutting hay, straw, and other vegetable matters, for the food of animals.—Sealed 27th October—6 months for inrolment.

John Mullins, of Battersea, surgeon, for improvements in making oxides of metals; in separating silver and other metals from their compounds with other metals; and in making white lead, sugar of lead, and other salts of lead, and salts of other metals.—Sealed 27th October—6 months for inrolment.

Rowland Williams, of Manchester, fustian shearer, for certain improvements in machinery or apparatus for raising, shearing, and finishing velvets or other piled goods, by power.—Sealed 27th October—6 months for inrolment.

CELESTIAL PHENOMENA FOR NOVEMBER, 1842.

D.	H.	M.	
1			Clock after the sun 16m. 17s.
	—		☽ rises 5h. 25m. M.
	—		☽ passes mer. 10h. 31m. M.
	—		☽ sets 3h. 25m. A.
	16	54	☿ in the ascending node
2		10	☿ in conj. with the ☽ diff. of dec. 5. 1. N.
	4	8	Ecliptic conj. or ● new moon.
3	6	1	♃'s first satt. will em.
3	21	15	♂ in Aphelion
5			Clock after the sun, 16m. 16s.
	—		☽ rises 10h. 42m. M.
	—		☽ passes mer. 2h. 23m. A.
	—		☽ sets 6h. 4m. A.
	10	59	♀ in conj. with the ☽ diff. of dec. 2. 59. S.
6	6	25	☿ in Perihelion
	13	14	♄ in conj. with the ☽ diff. of dec. 0. 35. N.
7			Occul *Jupiter*, im. 3h. 36m. em. 4h. 59m.
7	4	15	♃ in conj. with ☽ diff. of dec. 0. 51. S.
8			Occul ι Capri, im. 8h. 55m. em. 9h. 34m.
	4	54	♃'s second satt. will em.
9	0	30	☿ stationary
	9	40	Pallas stationary
10			Clock after the sun, 15m. 56s.
	—		☽ rises, 1h. 18m. M.
	—		☽ passes mer. 6h. 30m. A.
	—		☽ sets 11h. 52m. M.
	1	15	☽ in □ or first quarter.
	7	56	♃'s first satt. will em.
11	22		☽ in Apogee.
12			Occul k^2 Piscium, im. 9h. 25m. em. 10h. 38m.
12	17	43	♀ greatest brilliancy
	21	37	Her. in conj. with the ☽ diff. of dec. 6. 11. S.
13			Mercury R. A. 14h. 2m. dec. 10. 0. S.
	—		Venus R. A. 18h. 2m. dec. 27. 45. S.
	—		Mars R. A. 12h. 14m. dec. 0. 1. S.
	—		Vesta R. A. 9h. 40m. dec. 16. 7. N.
	—		Juno R. A. 17h. 20m. dec. 12. 53. S.
	—		Pallas R. A. 6h. 12m. dec. 27. 57. S.

D.	H.	M.	
	—		Ceres R. A. 8h. 44m. dec. 23 38. N.
	—		Jupiter R. A. 19h. 22m. dec. 22. 30. S.
	—		Saturn R. A. 18h. 46m. dec. 22. 43. S.
	—		Georg. R. A. 23h. 41m. dec. 2. 51. S.
	—		Mercury passes mer. 22h. 32m.
	—		Venus passes mer. 2h. 33m.
	—		Mars passes mer. 20h. 43m.
	—		Jupiter passes mer. 3h. 53m.
	—		Saturn passes mer. 3h. 17m.
	—		Georg. passes mer. 8h. 11m.
14	16	42	Vesta □ with ☉
15			Clock after the sun 15m. 15s.
	—		☽ rises 2h. 33m. A.
	—		☽ passes mer. 9h. 56m. A.
	—		☽ sets 4h. 24m. M.
	—		Occul 101 Piscium, im. 4h. 59m. em. 5h. 48m.
	7	32	♃'s second satt. will em.
16			Occul μ Arietis, im. 15h. 10m. em. 16h. 13m.
16	14	33	☿ greatest Hel. Lat. N.
	15		☿ greatest elong.
18	3	29	Ecliptic oppo. or ○ full moon
19			Occul Tauri, im. 4h. 33m. em. 5h. 16m.
	4	20	♃'s first satt. will em.
20			Clock after the sun, 14m. 14s.
	—		☽ rises 5h. 42m. A.
	—		☽ passes mer. 1h. 22m. M.
	—		☽ sets 10h. 1m. M.
22			Occul ξ Cancri, im. 9h. 27m. em. 9h. 53m.
	—		Occul d^2 Cancri, im. 16h. 14m. em. 16h. 58m.
25			Clock after the sun, 12m. 52s.
	—		☽ rises, Morn.
	—		☽ passes mer. 5h. 51m. M.
	—		☽ sets, 0h. 32m. A.
	—		Occul g^1 Leonis, im. 16h. 27m.
	8	59	☽ in □ or last quarter
26	6	15	♃'s first satt. will em.
27	5	6	♃'s third satt. will em.
27	16		☽ in Perigee
27	19	53	♂ in conj. with the ☽ diff. of dec. 7. 6. N.
28	0	17	♀ stationary
30	15	15	☿ in conj. with the ☽ diff. of dec. 5. 4. N.

J. LEWTHWAITE, Rotherhithe.

Miller's improvements in printing calicoes

Fig. 1

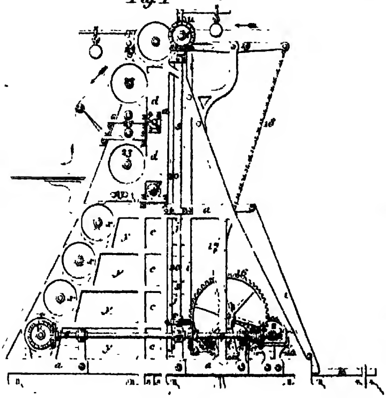


Fig. 2

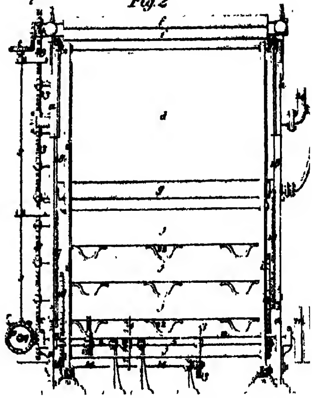
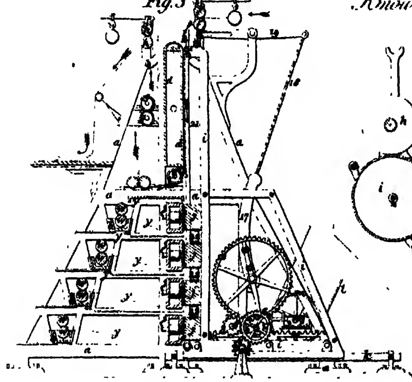


Fig. 3



Knowles's impts. in preparing cotton

Fig. 3

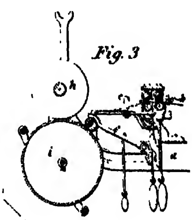


Fig. 1

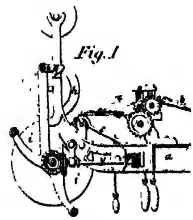
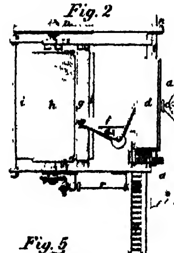


Fig. 2



Molineux's impd. lamp

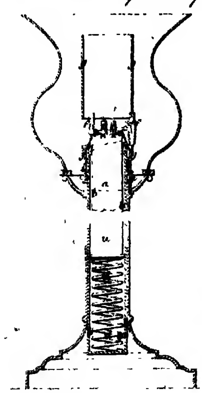


Fig. 4

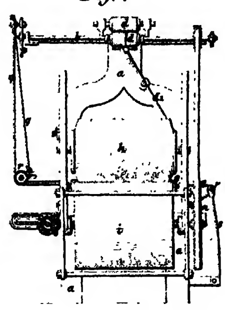
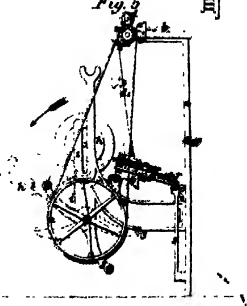
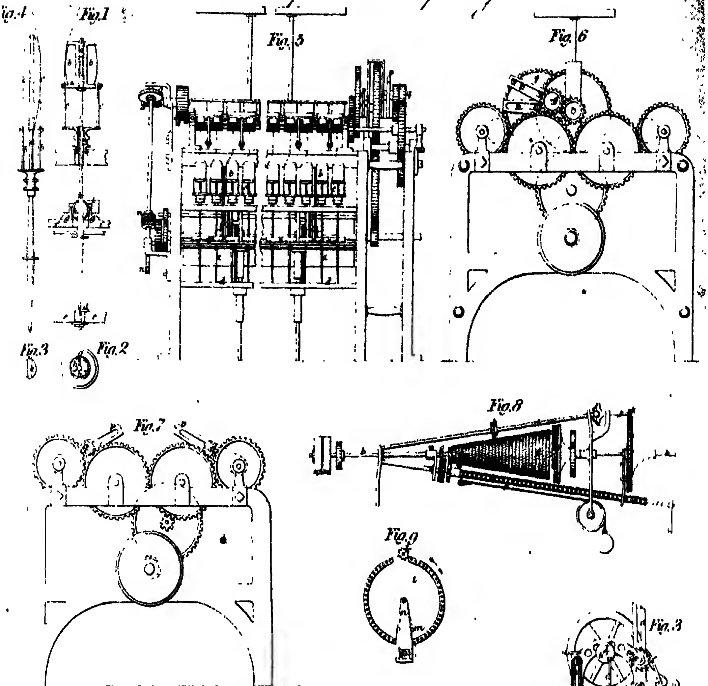


Fig. 5

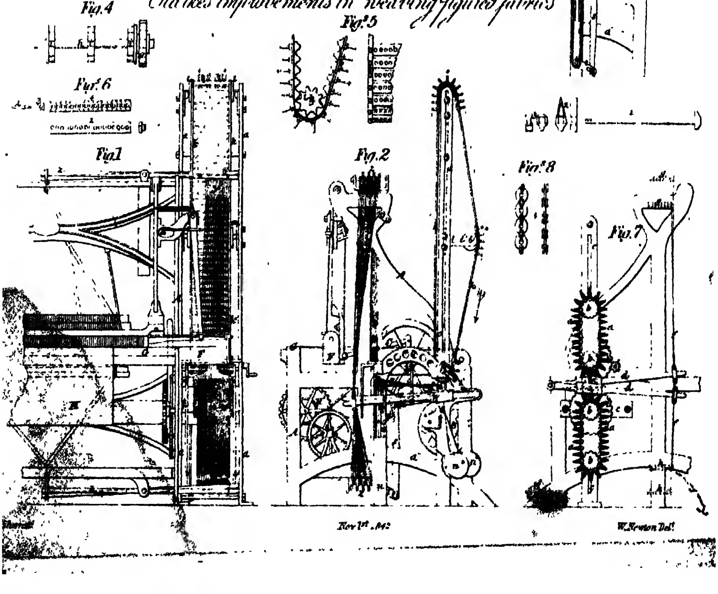


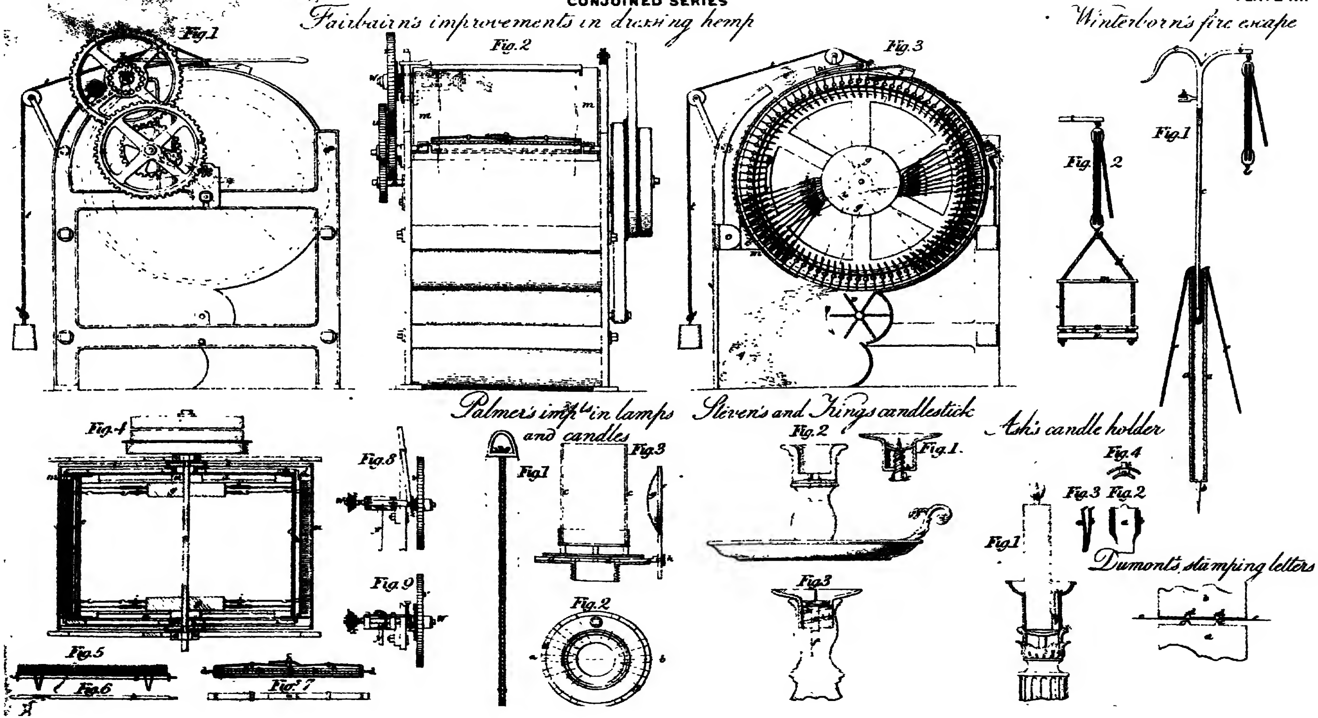
W. Newton, Delt. November 1st 1840 W. A. Beavan Sculpt.

Ormen's improvements in spinning



Clarke's improvements in weaving figured fabrics




Fairbairn's improvements in dressing hemp
Fig.1
Fig.2
Fig.3
Fig.4
Fig.5
Fig.6
Fig.s 7
Fig.8
Fig.9
Winterborn's fire escape
Fig.1
Fig. 2
Palmer's impts in lamps and candles
Fig.1
Fig.2
Fig.3
Steven's and King's candlestick
Fig.1.
Fig.2
Fig.3
Ash's candle holder
Fig.1
Fig.2
Fig.3
Fig.4
Dumont's stamping letters

THE

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JOURNAL AND REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXXXIII.

Recent Patents.

To CHARLES MAY, *of Ipswich, in the county of Suffolk, engineer, of the firm of J. R. & A. Ransom and Company, for his invention of improvements in machinery for cutting and preparing straw, hay, and other vegetable matters.*—[Sealed 6th July, 1840.]

THIS invention relates, firstly, to a mode of giving a change motion to such descriptions of chaff-cutting machines as work by means of two feed-rollers, driven by a screw-shaft.

In Plate XV., fig. 1, represents a side elevation, and fig. 2, a plan view of a machine, having the improvements applied thereto. *a*, is the ordinary fly-wheel, to which the cutting knives are applied; *b*, is the shaft on which the fly-wheel is mounted.

On the shaft *b*, as many wheels *c, c, c*, are applied, as the number of variations required in the relative speed of the cutting knives and the feeding rollers; care being taken that sufficient room is allowed between the wheels *c*, to prevent two pairs gearing at one time. *d*, is the worm-shaft, which gives motion to the two feed-rollers *e*, in the same manner as the fly-wheel and worm-shaft of ordinary chaff-cutters now work, and as is clearly shewn in the drawings. On the shaft *d*, are applied as many wheels

c^1, c^1, c^1, as there are wheels *c*, on the axis or shaft *b*; and as the wheels *c*, *c*, *c*, are all cast together, and such being the case in respect to the wheels c^1, in sliding them along their respective shafts, when the wheels *c*, c^1, are in gear, the others will be all out of gear. *g*, *g*, are set-screws, passing through the naves or bosses *c*, and c^1, by which, when the proper wheels are geared, the bosses are made fast to their respective shafts.

By this arrangement, it will be seen, that the motion of the feed-rollers may be readily changed, instead of at all times remaining at the same relative speed with the fly-wheel shaft; and, by this means, the vegetable matters, placed in the machine, may be cut to various lengths.

The second part of the invention relates to a mode of carding out or combing the vegetable materials to be cut in a chaff-engine, and thus to cause such vegetable matters to be laid longitudinally and evenly, when they arrive at the cutting knives.

There is also another improvement, shewn applied in the drawing about to be described, which constitutes the third part of the invention; it consists in giving a capability of movement to the presser-plate, independent of the movement of the upper feed-roller. Fig. 3, is a plan, and fig. 4, a sectional elevation of the machine; fig. 5, is a front elevation of some of the parts; and fig. 6, shews the manner of applying springs.

In this machine there are four pair of rollers, seven of which rollers have projecting spikes, and the eighth is a plain roller; and this, together with the other plain roller, shewn in the drawing, carries the endless cloth *z*, on to which the vegetable matter is to be laid; but it is not necessary that such care should be observed in drawing out the same lengthwise, as when placing the vegetable matter in an ordinary chaff-engine, as it will be found that the spiked surfaces employed will accomplish that part of the work. The vegetable matters are therefore simply to be placed on the upper surface of the endless cloth, in equal quantities all over the surface; and when they enter between the first pair of rollers *y*, *y*, (one being a spiked

roller,) the vegetable matters will be pinched between such rollers, and be drawn into the machine, and forced forward by the rollers *y*, *y*, towards the rollers *x*, *x*, which are both spiked rollers, and move with a surface speed somewhat greater than the surface speed of the rollers *y*, *y*; consequently the vegetable matters will be drawn out, and at the same time combed or carded by the spikes. As the next pair of rollers *w*, *w*, travel with a surface speed somewhat greater than the rollers *x*, *x*, the vegetable matter will, therefore, be drawn out still more, and at the same time carded or combed by the teeth; the next pair of rollers *u*, *u*, moving with a surface speed, somewhat greater than that of the rollers *w*, *w*, the vegetable matters will be still further drawn out and combed or carded, and laid longitudinally and smooth; and the feed-rollers moving with a surface speed, somewhat faster than the rollers *u*, *u*, the vegetable matters to be cut, will be continued smooth, and laid longitudinal, and in the best condition for the cut to take place, as the same is to be protruded from the mouth-piece and cutters. *v*, *v*, *v*, are guide-plates, fixed across the machine, to support the moving vegetable matters. It will be seen that the teeth of the lower rollers are interspersed between those of the neighbouring rollers, and, in revolving, work between them; and such is the case in respect to the upper rollers, but the teeth of the upper and under rollers do not pass between each other, but just clear one another at the points, as is clearly shewn.

By this arrangement the straw, hay, and other vegetable matters, fed into the machine, are drawn out and laid equally and longitudinally for the cutting knives; thus saving that care and skill of drawing out and charging of the engine by hand, heretofore necessary.

The difference of the speed given to the rollers *y*, *x*, *w*, *u*, and the feed-rollers, is accomplished, by having worms, of different angles, on the worm or screw-shaft, working into screw-wheels, on the axis of the upper and under rollers, in a similar manner to the working of the feed-rollers.

The third part of the invention, which is also shewn in

the above-mentioned figures, relates to a mode of applying the presser-plate of chaff-engines, and consists in giving it a movement, independent of the upper feed-roller, in place of rising and falling exactly to the extent of such upper feed-roller, as heretofore practised; by which improvement, the "wad" of vegetable matter, pressed between the roller, will be better held for the cut, and the varying thickness of the wad, passing between the feed-rollers, will thus remain more equally pressed. *t*, *t*, (see fig. 5,) is the frame or bridge, by which the weighted lever causes the upper feed-roller to press on to the lower feed-roller, as heretofore; but in place of the presser-plate *s*, being affixed, immoveably, to the upper bar or bridge of the frame *t*, as heretofore, the presser-plate is affixed to the bridge or bar *r*, which is allowed to move on the axis of the upper feed-roller, as is shewn in the drawing; and by means of the springs *q*, *q*, the bridge *r*, has, at all times, a tendency downwards. By this means, in addition to the movement up and down of the upper feed-roller, the presser-plate will, at all times, be pressed downward, thus producing greater uniformity in the closeness of the straw, hay, and other vegetable matters, passing between the rollers, which will be found very advantageous in working chaff-engines.

The fourth part of the invention relates to that description of chaff-cutting engine wherein blades are fixed, spirally, in a cylindrical frame, and is known as the "Doncaster chaff-engine," which was patented in the year 1804, by Thomas Pasmore, of Doncaster. In this engine, the bevil of the cutting edges of the knives, or spiral blades, is inwards, consequently considerable difficulty is found in sharpening the blades. Now, according to this part of the invention, the spiral blades or knives may be sharpened with much greater facility, owing to the bevil of the cutting edges being formed on the outer surface.

Figs. 7 and 8, shew the nature of the improved cutting knives or blades, and also the manner of fixing them to the cylinder.

The only part to which attention will be required to be called, is the circumstance of the cutting knives A, having

the bevil on the upper surface; the mode of sharpening which, is thereby introduced to such machines or engines, and will be found of considerable advantage. A sliding-plate, with steel face, capable of being set up by screws and slots, to the revolving cylinder, on which the spiral cutting knives are fixed, may be applied to the front part of the machine, and by spreading emery, or by other suitable sharpening material, and causing the revolution of the cylinder to be reversed, the cutting edges will be sharpened. When the blades or cutting knives are required to be ground, the cylinder is taken out of the machine and placed in the frame or machine B, B, see figs. 9 and 10,—fig. 9, being an end view, and fig. 10, a side view, of the machine for grinding the spiral knives or blades A. The axis of the cylinder, to which the knives are affixed, is placed in bearings C, C, by which it can revolve in a diagonal position. D, is the stone for grinding the blades;—this stone, in addition to its revolution, is capable of moving from side to side of the machine, by means of the lever-handle E; and the workman, in using this machine, moves the cylinder, with the knives A, slowly round, and at the same time, by the lever-handle, causes the stone to traverse slowly from side to side of the machine, commencing at one end of a spiral blade, and ending at the other, and then bringing the next blade round to be operated on, till the whole are ground. By this mode of applying spiral knives, and grinding and sharpening them, this description of chaff-engine or machine may be more advantageously used.

The fifth part of the invention relates to a mode of preparing gorse, by pounding and grinding, in order to render it fit food for cattle. Fig. 11, is a side elevation, partly in section, of the machine, constructed for this purpose, and fig. 12, is a plan thereof; figs. 13, are detached views of parts of the same machine. *a*, is the framing, the nature of which is clearly shewn in the drawing; it is to be fixed securely to the floor or ground; *b*, is the main shaft, to which rotary motion is to be communicated by means of a horse or other power, by the lever or arm *c*, or otherwise, as is well understood by machinists. On to the lower end of this shaft is affixed the circular trough *d*, and the lower

end of the shaft *b*, enters into a cup-bearing, as is shewn, and moves in a suitable bearing, at the upper end, as will readily be understood, on examining the drawing. *e, e*, are a series of inclined planes, formed on the plate e^1, which is keyed, or otherwise affixed on the shaft *b*; these inclined planes act under the plates *f*, formed on the stamper-rods *g*, and cause such rods, and their stampers, to be raised up and let fall successively, as the shaft *b*, revolves. As the rods *g*, are raised by the inclined planes, they will also be caused to revolve; and in order to take advantage of this movement of the rods, a cord, connected to a spring *h*, is applied to each rod *g*; and by this means the cord will be wound on the rod *g*; and when the end of an inclined plane passes from either of the rods *g*, in addition to the pounding or stamping action, produced by the fall of the stampers, they will revolve, and produce a grinding action. The rods *g*, slide freely up and down, and turn in bearings *i, i*.

In preparing gorse by this machine, it should be first cut small in a chaff-machine or otherwise, and then submitted to the action of the machine above described; after which it will be fit for cattle.

The patentee claims, Firstly.—The mode of constructing chaff-engines, which work by two feed-rollers, driven by a worm, by applying thereto change motions, as herein described.

Secondly.—The mode of laying the straw, hay, and other vegetable matters, in chaff-engines, longitudinal and even, by means of drawing out and combing, as herein described.

Thirdly.—The mode of applying the presser-plate of chaff-engines, by giving a movement independent of the upper feed-roller, as above described.

Fourthly.—The mode of applying spiral blades to chaff-engines or machines, and of sharpening and grinding, as above described, and—

Fifthly.—The mode of preparing gorse, by a machine, as herein described, by means of a circular trough and stampers.—[*Inrolled in the Inrolment Office, January*, 1841.]

To THOMAS KERR, ESQ., *of Forecrofts Dunse, in the county of Berwick, for a new and improved mortar or cement for building; also for mouldings, castings, statuary, tiles, pottery, imitations of soft and hard rocks, and other useful purposes; and which mortar or cement is applicable, as a manure, for promoting vegetation, and destroying noxious insects.*—[Sealed 22nd February, 1840.]

THE ingredients, of which the cement is composed, are divided into four classes, as follows:—First class.—The rakings or dust of roads, streets, &c., sweepings of houses and other buildings, ashes of coal and other fires; likewise small coal, culm, breeze, river or sea-sand, powdered free-stone, or any other mineral or vegetable substance, in the state of dust. These articles, previous to use, are passed through a sieve, similar to those employed by bricklayers for sifting the sand used in making mortar.

Second class.—Chalk or other calcareous matters.

Third class.—Tar, pitch, oil, resin, or other similar substances.

Fourth class.—Bay or common salt.

The cement, formed by combining together the above substances, in various proportions, is applicable for building, general plaster-work, and composition flooring; for covering flat wooden roofs, the weather boarding of wooden houses, and slate, tile, or thatched roofs; also for forming pavements and foot-paths, repairing and waterproofing old pavements, improving M'Adamized roads, and constructing the arches of bridges, culverts, &c. It is likewise used for mouldings, castings, statuary, tiles, pottery, imitations of hard and soft rocks, fire-bricks, gas and water-pipes, and for fuel.

The other purposes to which this invention may be applied, are very numerous; but, to indicate their general character, the patentee particularises the following:—Ropes, cables, bands, rick-cloths, tarpaulings, sheathings, girth-web, for hanging coaches, carts, gigs, &c.; and also

thick sheeting, for smothering fires in houses, ships, &c. These, and almost every other description of spun, twisted, woven, or felted articles, may be made waterproof and strengthened, by coating or impregnating them with a cement, formed of eight parts of the substances mentioned in the third class, four parts of those in the second class, and one or two parts of the whale or other oils in the third class. The articles are steeped in this, from three to six days, and after that boiled for a few minutes in a similar cement; then all superfluous moisture is squeezed out of them, and they are dried, rubbed, and otherwise finished.

Paper, pasteboard, &c., may be rendered waterproof, as well as stronger, by adding to the pulp one part of the third class, and one of the second class.

Ships' boats, and other sailing craft, may be coated outside and inside with the cement, and thus rendered impervious to water, and secure from the ravages of vermin. For the outside coating, the cement is composed of two parts of the first class, one part of the second class, one part of the pitch (in a melted state) of the third class, and one part of the fourth class; for the inside, one other part of the first class is added. The cement is laid on while hot, and three or more coatings are given, as required.

When employed as a manure, the cement is made of one part of the second class, one part of the oils and pitch of the third class, in a melted state, and two parts of the fourth class; after these are mixed together, four parts of the first class are added, and the whole is stirred up, until the mixture acquires a toughness similar to that of the best mortar used by bricklayers. Previous to depositing plants in earth, manured with this cement, their roots are to receive a coating of tar.—[*Inrolled in the Inrolment Office, August*, 1840.]

To James Hay, *of Belton, Scotland, Captain in the Royal Navy, for an improved plough, which he entitles " the Belton plough."*—[Sealed 25th March, 1840.]

This improved plough is so formed, that the direction in

which it is working may, at any time, be reversed, without turning the body of the plough.

In Plate XVI., fig. 1, is a view of the plough, taken on the furrow side; and fig. 2, is a plan of the plough. *a*, is the plough-beam, which is furnished with handles, bridle, and coulter, as usual, and is capable of turning on the bolt *b*, carried by the bar *c*; this bar supports the beam *a*, and they are locked together, when the plough is working, by the glands *d*, and *e*, which embrace the ends of the bar *c*. The gland *d*, turns upon a pin *f*, and is connected by the link *g*, with the rod *h*. The gland *e*, turns upon a pin *i*, and is also connected with a rod *h*, by a link *j*. The rod *h*, terminates in a handle, by pulling which, the glands are caused to turn upon their pins, and release the beam *a*, from the bar *c*.

On one side of the body of the plough, two mould-boards *k*, *k*, are affixed, terminating in two shares *l*, *l*, the feather or cutting edges of which lie on the same side as those of the mould-boards. The soles *m*, *m*, fastened to the mould-boards, are not in the same plane with each other, but form an angle of about 176°; this angle may, however, be varied. The land side of the plough is formed in two vertical planes, which are inclined from each other, forming an angle of 176°.

When it is desired to reverse the direction in which the plough is working, the attendant, by pulling the handle *h*, releases the beam *a*, from the bar *c*, and then guides the horses round to the place where he stood. The fore-end of the plough-beam, and the handles, are thus caused to change places, and the glands being returned to their former position, by pushing forwards the handle *h*, the plough is again ready for use.

The patentee claims, combining the different parts, in the manner above described, together with the inclination of the land side planes, as also above described.—[*Inrolled in the Petty Bag Office, September,* 1840.]

To Robert Cooper, *of Petworth, near Evesham, in the county of Gloucester, Gent., for improvements in ploughs.*—[Sealed 16th April, 1840.]

This invention consists in an improved construction of drain-plough, for forming trenches in land.

In Plate XVI., a side view of the plough is shewn, the near wheels being removed, for the purpose of exhibiting the other parts more clearly. *a,* is one of two revolving coulters, which cut through the turf, in advance of the fixed cutters *b,* and thereby preserve the edges of the trench clean and even; they are carried by two stems *c,* fastened to the plough-beams *d,* by screws *e,* and wedges *f.* The distance of the coulters *a,* from each other, is adjusted by turning the nuts *g,* which work upon a rod that passes through both the stems *c,* and the depth of their cut is regulated by means of the slots in the upper ends of those stems.

The coulters *b,* form the sides of the trench, and are attached to the plough-beams *d,* by screws *e,* and wedges *f,* in the same manner as the stems *c.* Immediately behind these coulters, two land-plates *h,* made with cutting edges, are affixed to the beams *d,* and, as they have the same degree of inclination as the coulters, they preserve the sides of the trench perfectly smooth and unbroken. To the lower edges of the land-plates a sledge *i,* is secured, furnished with a share or cutting-edge *j,* for making the horizontal cut that forms the bottom of the trench; from the share, an inclined plane *k,* rises between the land-plates, and terminates in a platform *l,* which is curved towards the right-hand side of the plough. The earth, as it is cut by the coulters and share, ascends the inclined plane, and is delivered by the platform on the right-hand side of the trench.

The plough is carried by four wheels *m,* and *n*; the hind wheels *m,* are attached to the arms or cranks *o,* of a cranked axle *p,* upon which, at the left-hand side of the plough, a worm-wheel *q,* is keyed, taking into a worm *r,* provided

with a handle; by turning this handle, the axle *p*, is caused to revolve, until, by the ascent of the cranks, the plough is raised from the ground.

The wheels *n*, are mounted upon an axle *s*, from which two standards *t*, rise, and support a screw *u*, furnished with handles *v*, *v*. The screw passes through a nut *w*, that connects the front ends of the plough-beams together, and by turning the handles *v*, *v*, those ends are raised or lowered, as required.

x, *x*, are two rods, one of which is attached to the framing of the screw at *y*, its other end resting in one of the clamp-hooks *z*; the other rod is attached to the fore-axle, and rests in the other clamp-hook. By turning the screw 1, after the rods have been adjusted, the clamp-hooks are caused to bind them tightly against the bar 2, and prevent their moving. The apparent use of these rods is to keep the plough-beams steady when working, or in an elevated position; but this is not distinctly stated in the specification.

The dotted lines shew the situations of the different parts when the plough is raised from the ground, for the purpose of transporting it from one place to another.

When the plough is required to work on the side of a hill, or other uneven ground, the hind-wheels are mounted upon different axles, each provided with a worm-wheel *q*, and worm *r*; by means of which, the wheels and their axles are suitably adjusted for keeping both of the plough-beams at the same height.—[*Inrolled in the Inrolment Office, October*, 1840.]

To John Sanders, *and* William Williams, *of the town of Bedford, in the county of Bedford, iron-founders, and* Samuel Lawrence Taylor, *of Old Warden, in the said county of Bedford, machine-maker, for improvements in ploughs.*—[Sealed 3rd August, 1840.]

These improvements consist in various methods of fastening the coulter to the beam of a plough, by means of which, the inclination of the coulter, and its distance from the beam, can be regulated and adjusted with great nicety.

In Plate XVI., fig. 1, is a side view of a plough, shewing the first method of applying the coulter. *a*, is a metal plate, which turns upon a bolt *b*, passed through the plough-beam *c*; from this plate another plate *d*, projects, at right angles to it, having a dove-tail projection on its face, upon which the plate *e*, slides to or from the plough-beam. The front of the plate *e*, is made concave, to receive the stem of the coulter *f*, which is held in close contact with the plate, by the clamp *g*, when the screw *h*, which passes through the back of the clamp *g*, is turned, so as to abut against the plate *d*.

The distance of the coulter from the beam *c*, is regulated by moving the plate *e*, along the dove-tail projection on the plate *d*; and the coulter is adjusted to any required degree of inclination, by turning the screw *i*, which passes through the nut *j*, and presses upon a projection of the plate *a*.

Fig. 2, shews another mode of fastening the coulter, which is similar, in many respects, to the preceding one; but, in this arrangement, the plate *a*, is dispensed with. On the plate *d*, an arm or bent plate *k*, is formed, which carries the plate *l*, with the slot *m*, in it; and through this slot, a bolt *n*, is inserted, to secure the apparatus to the plough-beam. Through the upper part of the plate *l*, the end of the screw *i*, passes, and rests upon the beam *c*; so that, by turning this screw, the plate *l*, will be raised or lowered, and the coulter adjusted to the required angle. The coulter is secured to the beam by means of the plate *e*, clamp *g*, and screw *h*, as before.

Fig. 3, is a side view, and fig. 4, a plan of another mode of securing the coulter. *o*, is a socket, (shewn detached in two views, at fig. 5,) which slides upon the plough-beam, and is fastened at any part of the same by its screw *p*. From the socket an angular-faced plate *q*, projects; and against this plate, the coulter is firmly held by the clamp *r*. The clamp *r*, consists of a plate, bent, at right angles, at top and bottom, and having two recesses *s*, *s*, formed therein; it is also furnished with two screws *t*, *t*, which have each an eye, to receive the stem of the coulter, and by means of

their screw-nuts *u, u*, draw it tightly against the angular face of the plate *q*. The inclination of the coulter is varied by screwing the upper or lower nuts more or less tight, and it is fixed on the plate *q*, at any required distance from the beam *c*, by the clamp *r*.

Fig. 6, represents the fourth method of applying the coulter, and fig. 7, is a side view of the socket used for that purpose. The socket *v*, slides upon the plough-beam, and is fixed at any part of the same by a screw, like the socket *o*, before mentioned. It has a projecting plate *w*, on which a plate *e*, with a concave face, moves, and serves, with the clamp *g*, and screw *h*, to secure the coulter to the beam. The socket *v*, by reason of its peculiar shape, is capable of rocking on the beam *c*, being retained, in any desired position, by its screw *i*; and by this means the inclination of the coulter is varied.

The fifth and last method of securing the coulter, is shewn in fig. 8. The coulter is fastened on any part of the beam *c*, by the clamp *g*, and screw *h*, and is caused to stand out at any angle therefrom, by the sliding plate *x*, formed with a groove in it to receive the stem of the coulter; the lower part of which plate is moved any required distance outwards from the beam, by two screws *y*;—one only is shewn.

The patentees claim, Firstly.—The modes, herein described, of applying coulters to ploughs, whereby they are enabled, by means of clamps and screws, to regulate the distance of the coulter from the beam, and also the angular position of the coulter, as shewn in figs. 1, 2, 3, 4, 5, 6, and 7.

Secondly.—The mode of applying a coulter, shewn in fig. 8, whereby the coulter is caused to stand off at an angle, by means of the screws *y*, and plate *x*.—[*Inrolled in the Inrolment Office, February*, 1841.]

To Downes Edwards, *of Surbiton-hill, Kingston, farmer, for improvements in preserving potatoes and other vegetable substances.*—[Sealed 8th August, 1840.]

This invention consists in a method of operating upon potatoes, in order to preserve the same for a long period.

The potatoes are first cleansed from dirt, and boiled or steamed until their skins begin to crack; they are then stripped of their skins, the eyes and specks carefully picked out, and are placed in an iron cylinder. The cylinder is tinned on the inside, and perforated with a number of holes, one-eighth of an inch in diameter, through which the potatoes are forced, by the descent of a piston. The potatoe-pulp is then dried, by spreading it thinly upon hollow iron tables, which are heated, by steam, to from 100° to 160° Fahr. During the operation of drying, the pulp is well raked, and afterwards it is packed in casks, or other suitable vessels. The steam is supplied from a boiler, in which it is kept at a pressure of 10 lbs. to the inch, and the heat of the tables is varied by opening and closing the cocks upon the supply pipe; the heat being lowered as the potatoe approaches dryness.

The patentee claims the mode of preserving potatoes in a cooked or partially cooked state, by means of obtaining the substance of potatoes in a separated, or finely divided, and dried state.—[*Inrolled in the Inrolment Office, February*, 1841.]

To Frederick Payne Mackelcan, *of Birmingham, civil engineer, for certain improved thrashing machinery, a portion of which may be used as a means of transmitting power to other machinery.*—[Sealed 1st October, 1840.]

The first part of this invention consists in a combination of machinery, for communicating the power of a prime

mover, but particularly the power of horses, to the drum of a thrashing-machine, or similar apparatus.

This machinery is represented, partly in section, in Plate XVII., at fig. 1. *a, a*, is a framing, containing two shafts *b*, and *c*; on the shaft *b*, a spur-wheel *d*, is keyed, and at its upper end is a cross-head *e*, to which a beam or pole *f*, is bolted, having at one end a counterpoise weight *g*, and at the other a hook *h*, to which the horse is attached. The spur-wheel *d*, takes into the pinion *i*, on the shaft *c*, and thus communicates motion to a large pulley *j*, on the lower end of this shaft. Around the pulley *j*, an endless band *k*, is passed; it thence proceeds through wooden troughs *l*, under the horse-path, to the machinery required to be driven. The pulley *j*, is not keyed on its axis, but is carried round with it by a ratchet-wheel and pall, at *m*, when the prime mover is acting in the proper direction; but when that action is reversed or stopped, the pulley and its shaft are permitted to move independently of each other.

A modification of this horse-engine is described, wherein the large pulley is placed within the framing *a, a*, instead of below it.

The second improvement consists in a mode of connecting the concave surface, commonly called the "bed," to the framing of a thrashing-machine.

Fig. 2, is a section of a thrashing-machine. *n*, is the feeding table; *o*, the drum, which is formed by fixing two metal discs *p*, on a shaft *q*, near its ends, and then bolting to each disc the arms *r*; the outer ends of these arms are connected together by the bars or beaters *s*, and the drum is finished by nailing on the boards *t*.—*u*, is the bed, on the under surface of which the fluted iron plates *v*, are fastened; it is attached to the frame of the machine by the hinge *w*, in such a manner, that a line drawn from, and parallel to, the part *, of the hinge, will be a tangent to the centre of the arch formed by the concave fluted surface of the bed. The distance of the fluted plates *v*, from the drum, is regulated by two screws *x*, which pass through a part of the bed, and rest on the feeding table.

The corn is fed into the mouth of the machine, and,

after being carried along the fluted surface of the bed, by the beaters *s*, is thrown out upon the floor. If, by chance, too large a quantity of corn, to be passed through the ordinary space between the bed and the drum, is introduced, the bed rises upon its hinge, and allows it to pass.

When thrashing unbound grain, such as barley, the patentee uses a cylinder and bed, studded with large-headed nails, instead of the drum *o*, and bed *u*, above described.

The third improvement consists in the application of a broad endless band, as a substitute for the ordinary feeding-table.

This band passes round two rollers, one at the mouth of the machine, and the other at the end of the feeding-table. The first-mentioned roller is driven by a strap from the drum-shaft, and communicates motion to another roller above it. The corn being deposited upon the endless band, is carried forward by it, and delivered by the rollers into the machine.

The patentee claims, Firstly.—The horse-engine.

Secondly.—Hinging the bed of the thrashing-machine in the line of tangent to the centre part of the concave.

Thirdly.—The endless band, as a moving feeding-table.

Fourthly.—The cylinder and bed, studded with large-headed nails.—[*Inrolled in the Inrolment Office, April,* 1841.]

To William Cooper, *of Layham, Suffolk, iron-founder, for an improved method of constructing thrashing machines, and other agricultural instruments.*—[Sealed 21st January, 1841.]

This invention, the specification of which is not illustrated by drawings, consists in an arrangement of mechanism for driving thrashing machines, chaff-cutting machines, and mealing mills.

It is applied to thrashing machines, as follows:—Through the machine a horizontal shaft extends, parallel to the shaft that carries the beaters, having upon one end of it a

fly-wheel, and on the other end a cog-wheel, which takes into a pinion on the beater-shaft. Across the top of the machine, near the front end, a large horizontal iron beam is fastened, and in a shoulder, at each end of it, two eyes, furnished with brass collars, are fixed, about three or four inches asunder. In each pair of eyes a small iron bar plays, from the centre of which a pin rises, and upon it a lever is fastened, by means of a nut. The short end or beak of each lever is connected by a rod to a crank upon the fly-wheel, or cog-wheel, and, manual power being applied to the other ends of the levers, motion is thus communicated to the beater-shaft.

When horse-power is employed, a strong wooden frame is erected, and in it a vertical shaft is mounted, with a large horizontal cog-wheel upon the lower end of it. The cog-wheel takes into two pinions, on the ends of two horizontal shafts, the other ends of which are formed into cranks, and connected by rods to the long ends of the levers before mentioned. The horses are attached to the upper part of the vertical shaft, in the usual way.

In the chaff-cutting machine, the arrangement is the same; the fly and cog-wheels being mounted on a shaft which extends along one side of the machine, and the cog-wheel takes into a pinion on the spindle of the knife-wheel.

When this invention is applied to a mealing mill, a large sidus cog-wheel is used, which takes into teeth on the lower end of the mill-shaft.

The patentee claims, firstly, with respect to the thrashing machine, the application of the lever to the fly and cog-wheels, (whether worked by horse-power or by hand,) so as to set the beaters in motion, by the power derived from the lever.

Secondly.—As an improvement in the chaff-cutting machine, the above-mentioned application of the lever, so as to set in motion the wheel on which the knives are fixed, by the power derived from the lever.

Thirdly.—As an improvement in the mealing-mill, the above-mentioned application of the lever, so as to set the

mill-stones in motion, by the power derived from the lever. —[*Inrolled in the Inrolment Office, March*, 1841.]

To JOSEPH PRYOR, *of Wendron, in the county of Cornwall, builder, for an improved thrashing machine.*—[Sealed 28th January, 1841.]

THIS invention consists in a machine for thrashing corn, a vertical section of which is shewn in Plate XVII.

The machine is composed of a strong wooden frame *a*, supported by four legs *b*, upon which two horizontal shafts *c*, *d*, are mounted. To each end of the shaft *c*, a handle *e*, is fastened, and upon it a fly-wheel *f*, and a spur-wheel, (not shewn in the drawing,) are keyed, one on each side of the frame *a*; the spur-wheel taking into a pinion on the end of the shaft *d*. This shaft *d*, carries a drum *g*, furnished with eight or more angular beaters *h*, and having a semi-circular cover *i*, in which is an opening *j*, for introducing the corn to be operated on. In front of the drum is a rack *k*, formed with a concave face, upon which a series of angular plates of iron *l*, are fixed; it is capable of sliding backwards or forwards on the beam *m*, and its distance from the drum is regulated by turning the screw *n*, which works through the nut *o*, in the front rail of the frame.

The action of the machine is as follows:—By turning the handles *e*, the drum *g*, is caused to revolve, and the corn, being fed in at the opening *j*, is acted upon by the beaters *h*, and rack *k*; the seeds and straw are thus separated from each other, and are discharged at the hind end of the machine.

The patentee claims, the general arrangement and combination of parts of which the thrashing machine is made up, and by which a new and improved mode of operation is introduced.—[*Inrolled in the Inrolment Office, July*, 1841.]

To William Crosskill, *of Beverley, iron-founder and engineer, for improvements in machinery for rolling and crushing land, and in machinery to be used in the culture of grass land.*—[Sealed 8th September, 1841.]

The first part of these improvements consists in a machine for rolling and crushing land.

In Plate XVI., fig. 1, is a side view of the machine,—it consists of a frame *a, a,* carrying an axle *b,* on which a series of narrow rollers *c,* are mounted, being capable of turning thereon, independently of each other. On the periphery of each roller the teeth *d,* are formed, and at right angles to these, another series of teeth *e,* are fixed. The teeth *e,* project on each side of the roller, and are so situated around it, that a line, passing through the centre of any one of them, would cut the outside face of the boss, in which the axle works, as shewn by the dotted line *f, g.* When the machine is to be moved from one place to another, a pair of running wheels are fastened upon the axle *b,* as shewn by the dotted circle *h.*

The second part of the invention consists in a machine for cutting narrow trenches, at short distances apart, in grass land, and depositing seed and manure therein.

Fig. 2, is a side view of the machine, complete; and fig. 3, a plan of the same, with the seed and manure-chest removed, to shew the different parts more clearly. The trenches are formed by a series of cutters *a,* which pass through slits in the plate *b,* and are suspended from the bar *c,* by passing that bar through an eye in the upper end of each cutter. The bar *c,* is attached, by links, to two arms *d, d,* affixed on the axis *e*; from each end of which axis, also, a lever *f,* projects, provided with a sliding weight *g,* to regulate the pressure used for forcing the cutters through the turf. These levers are connected by rods *h,* to the levers *i, i,* which are mounted on axes *j, j,* and united by a handle *k.*

The remaining parts of the machine are similar to those of ordinary drills. *l,* is the seed and manure-chest, which

turns on axes at each end, and can be adjusted for working on a level, or up and down hill, by means of the handle *m*, worm *n*, worm-wheel *o*, and rack *p*. *q*, is the cog-wheel of the drill, driven by the train of wheels *r*, *s*, *t*, from the hind axle of the machine; and *u*, are the tubes of the drill, attached to the hopper *v*.

When the cutters *a*, become clogged with earth, or are required to be thrown out of action, the attendant depresses the handle *k*, and thus, through the medium of the levers *f*, *f*, and *i*, *i*, and their appendages, raises the cutters, from which the earth is removed by the edges of the slits in the plate *b*. The cutters can be retained in their raised position, by inserting a stop in the upper parts of the curved bars *w*, under the levers *f*, *f*; and the depth at which the cutters are required to work, is regulated by inserting a stop in the lower parts of the bars *w*, above the levers *f*, *f*.

The patentee claims, Firstly.—The mode of applying the teeth *e*, (fig. 1.) of the rolling surfaces *c*, for rolling and crushing land; and also placing rolling surfaces *c*, having teeth on their circumferences, in such a manner as to turn independently of each other, as above described.

Secondly.—The mode of arranging a series of cutters, in a suitable carriage, for producing narrow trenches or cuts through the turf of grass land: whereby such cutters can be lifted and cleared from time to time; and combining therewith suitable drills, for sowing seed and manure in such cuts or trenches, as above described.—[*Inrolled in the Inrolment Office, March*, 1842.]

To JOHN BENNER LAWES, *of Rothamstead, in the county of Hertford, Gent., for certain improvements in manure.*—[Sealed 23rd May, 1842.]

THE first improvement consists in decomposing bones, bone-ash, bone-dust, apatite, or phosphorite, and other phosphoritic substances, previous to using the same as manure, by mixing with them a quantity of sulphuric acid, sufficient

to set free as much phosphoric acid as will hold in solution the undecomposed phosphate of lime. The free phosphoric acid is, by this means, enabled to unite itself at once with the various alkaline earths contained in the soil, and the undecomposed phosphate of lime is left in a state of more minute division than can be effected by mechanical means.

The second improvement relates to manures for soils which are deficient in any particular alkali, and consists in manufacturing the manure by mixing phosphoric acid with the alkali required.

The third improvement relates to the formation of manure for those soils from which a crop of wheat, or any other plant, whereof silica forms an essential component part, is desired to be raised. The manure consists of a mixture of silica, in the state of ground flint, sand, crystal, or glass, with either of the alkalies, potash, or soda.

The patentee claims, Firstly.—The combination, for the purposes of manure, of bones, or bone-ash, or bone-dust, or apatite, or phosphorite, or any other substance containing phosphoric acid, with sulphuric acid, as aforesaid.

Secondly.—The combination, for the purposes of manure, of phosphoric acid with any of the alkalies, potash, or soda, or ammonia, or any of the alkaline earths, lime, or magnesia, or alumina, as aforesaid.

Thirdly.—The combination, for the purposes of manure of silica, as aforesaid.—[*Inrolled in the Inrolment Office, November*, 1842.]

To Sir James Murray, *of Merrion-square, Dublin, Knt., and Doctor of Medicine, for an improved method of combining various materials, in a manner not hitherto in use, for the purpose of manure.*—[Sealed 23rd May, 1842.]

The main object of this invention is to produce a compound, which, when mixed with the earth or soil, will generate within it carbonic acid, and a variety of useful

salts, and thus increase the supply of nutriment for vegetables, and improve the quality of crops generally.

The means employed, by the patentee, for effecting this improvement, consist in drying up and solidifying phosphoric acid, and the common mineral acids, by mixing them with dry, porous, and absorbent matters, vegetable, animal, or mineral, such as bran, saw-dust, malt-dust, husks of seeds, brewers' grains, ground rags, pulverized rape or linseed cakes, refuse of flax, leaves and bark of trees, dry tan, siliceous sands, peat, or other sandy mould, dry earth, finely sifted cinders, and other like substances. When the acids are absorbed by any of these matters, and converted into powder, they may be more advantageously combined with alkaline substances, and worked into the ground in a dry state; the chemical action, above mentioned, taking place afterwards, when excited by the moisture present in the soil, or which may subsequently fall upon it.

The acids, used by the patentee, are phosphoric, nitric, muriatic, and sulphuric; the nitric acid being reduced to an uniform specific gravity of 1.200, and the sulphuric acid to 1.600.

The acidulous compounds or powders, which are produced from the acids, and afterwards mixed with alkaline substances, previous to their being used as manure, are five in number, viz., phosphoric compound or powder, acidulous nitric powder, acidulous muriatic powder, acidulous vitriolated powder, and consolidated acid compound.

The phosphoric compound or powder consists of an equal weight of apatite, or phosphorite, and sulphuric, or any other of the acids, which are mixed together, and agitated in an earthen vessel, for two or three days; the mixture is then converted into compost, by the addition of a sufficient quantity of some of the absorbent matters.

The acidulous nitric powder is made by mixing nitric acid with a sufficient quantity of absorbent matter, to form a dry compost; and when it is to be used as manure, an equal weight of powdered sulphate of lime is combined with it, and the mixture is packed in casks, or earthen jars, from which the air is carefully excluded.

The acidulous muriatic powder is composed in the same manner as that just described, with this exception, that muriatic acid is substituted for the nitric acid.

The acidulous vitriolated powder is produced by mixing sulphuric acid with enough absorbent matter to form a dry powdery compost; and to this compost, when required for agricultural purposes, an equal weight of dry powdered acidulous sulphate of soda, and also a like quantity of dry powdered acidulous sulphate of potash, are added.

The consolidated acid compound is formed by combining together two, or more, or even all the acidulous powders before described.

The alkaline substances, with which the acidulous powders are to be mixed, are the supercarbonates, carbonates, and even subcarbonates of soda, potash, and ammonia, and also the carbonate of lime. These substances, the patentee prefers to mix together in equal quantities, and thus produce what he calls the alkaline mixture, which is combined with any of the acidulous powders, in equal quantities, and is then termed the fertilizing compost or powder.

The patentee claims, Firstly.—The acid powdery compound, (five kinds of which are described,) whereby the hitherto liquid acids are rendered solid and portable, and thereby capable of being brought, advantageously and conveniently, into combination with alkalies, and alkaline earths.

Secondly.—The combination of the acid powdery compound with an alkaline mixture, and the compost or manure thence resulting.

Thirdly.—The compound resulting from the mixture of a mineral acid or acids with a porous powdery substance, so as to mechanically solidify the acid or acids, or absorb it or them, into the powder; and also the combination of such compound with alkaline or earthy carbonates, for the evolving of carbonic acid within the soil, and about the roots of vegetables, and for generating salts upon and within the ground itself, instead of spreading such salts, in crystals or powder, over the surface of the land, as heretofore.—[*Inrolled in the Inrolment Office, November*, 1842.]

To Samuel Howard, *of Manchester, engineer, for improvements in boilers and furnaces.*—[Sealed 8th August, 1840.]

These improvements, in boilers and furnaces, consist, Firstly.—In certain peculiarities of form and construction of boiler, whereby a considerable increase of heated surface is obtained; also a mode of feeding the boiler with water, when required, which is applicable to marine, stationary, and auxiliary boilers.

Secondly.—In certain peculiarities of arrangement and construction of furnaces, whereby the gases or vapours, emitted from the fuel in a state of combustion, are made available for producing heat, thus lessening the amount of fuel consumed; and also a means of regulating the draft in such furnaces. This part of the invention is applicable in all cases where furnaces or fire-places are used.

In Plate XVI., fig. 1, is a longitudinal vertical section of a marine boiler, shewing the improvements, as applied thereto; fig. 2, is a transverse section of the same, in the line a, b, fig. 1; figs. 3 and 4, represent, in longitudinal and transverse vertical section, a boiler for stationary engines; and figs. 5 and 6, are similar views of a common waggon boiler, with the improved auxiliary adapted thereto.

It will be observed, on reference to fig. 2, that the boiler is divided into three compartments, marked A, B, and C, the two outer ones, A, and C, being furnished with a pipe D, through which the steam, generated in each of them, is conducted to the chamber E, which also receives that from the centre compartment B; in this chamber is placed the steam-pipe, as shewn in fig. 1.—F, F, are a series of water-chambers, so formed and arranged, with regard to the flues G, G, that the heat is made to pass through the entire series, in a sort of grooved passage or way, taking a slight rise, somewhat in the form of a spiral coil, as shewn in the section, fig. 2, so that its progress constantly tends towards the upper chambers, and thus a large surface of water is exposed to the action of heat, and a rapid generation of

steam effected. It will be further perceived, on reference to the same figure, that each set of fire-places and flues is contained in a case, entirely surrounded with water, thus bringing an additional surface in contact with a strong heat, for the purpose of generating steam.

The apparatus (marked H,) for feeding the boiler with water, is shewn, in section, at fig. 3.—*a*, is a pipe, communicating with a cistern or water-tank, (not shewn in the drawing,) which tank, through the medium of a pipe, in connection with the ordinary feed-pipe, receives the overplus of water supplied; through this pipe *a*, water may enter into the upper part of the cylindrical vessel *b*, which is so constructed, that in its centre, and at its lower extremity, a kind of neck is formed, for the purpose of regulating the admission of water into the boiler, by means of the valves *c*, and *d*; these valves are fixed upon rods *e*, and fit into conical seats, made in the necks of the vessel *b*; the action of this piece of apparatus is as follows:—The lower end of the vertical rod, to which the valve *d*, is attached, being jointed to a lever *f*, having its fulcrum at *g*, and this lever having, at its other extremity, a rod, to which a float is suspended, as the level of the water in the boiler sinks, the lower valve *d*, will rise from its seat, by the ascent of that end of the lever *f*, which is connected with the rod *e*, consequent upon the depression of the opposite end of the same lever, by the descent of the float; it will, therefore, be obvious, that the boiler is now enabled to receive a fresh supply of water from the vessel *b*, as soon as the upper valve *c*, is opened, which may be done, either by a rod on the end of the chain, attached to the rod *h*, in the hands of the workman,—or it may be done (as shewn) in connection with the apparatus for regulating the draft of the furnace, hereinafter to be described. It will also be understood, that as the level of the water in the boiler rises, the lower valve *d*, will be closed, through the connection shewn between it and the float, and consequently prevent the admission of more water.

The improvements in boilers, for stationary engines, are shewn at figs. 3 and 4. On reference to the former figure,

it will be seen that the under side is made to assume a curved form, (which might be varied from that shewn if found desirable,) the object being to increase the heated surface.

The improvements, as applied to auxiliary boilers, are represented at figs. 5 and 6, the former being a longitudinal section, taken through the centre of the boiler, and the latter a transverse section, in the line c, d.

It will be perceived, that in these figures, a common waggon boiler is represented, with the addition of an auxiliary boiler, as at N, placed underneath, and communicating with it through the pipes I, K. From the situation of the auxiliary boiler, (as seen at fig. 6,) it must be obvious, that all its parts are well exposed to the action of the fire. These auxiliaries apply also to round boilers, with slight variations of form and construction.

In order to describe the improvements relating to furnaces, reference must again be had to the figures, from 1 to 6, in all which, as also in figs. 7 and 8, the improved furnaces are exhibited.

The intention of the patentee, in the application and construction of these furnaces, is to introduce a method of carbonizing or coking the fuel before it is consumed, and thus separate the component gases, which being afterwards passed over a strong fire, are availably consumed. The manner in which this is effected, will be seen by reference to fig. 3. A fire is first made in the upper and lower fire-places L, and M; a charge of fuel is then placed upon the carbonizing plate N, and this, being heated, extracts its gases, which, in passing over the fire, are consumed; the fuel, in a carbonized state, is then pressed upon the bars, and the plate N, re-charged.

At figs. 5 and 6, is represented a furnace, embodying similar advantages to that just described, viz., a thorough consumption of the gases contained in the fuel, and the equal distribution of heat to all parts of the boiler. The improved furnace is here shewn, applied to an ordinary waggon boiler, with its auxiliary. In this furnace, an arch is also shewn, within a short space of the boiler, under which is a passage for the heavy gases.

At fig. 7, is an application of the same principle to stoves, by placing the carbonizing or coking-plate over the ordinary fire; the gases, which rise from the fuel, descend through the aperture shewn in the plate N, and are consumed, by passing over the lower fire.

At fig. 8, this principle is exhibited as applicable to stills, &c., in which also is represented a peculiarity of construction at O, whereby the fire-place is contracted, and the heat directed more immediately to the centre of the still.

The means of regulating the draft of the improved furnaces, is described by reference to fig. 3, in which the apparatus, for this purpose, is shew at P. The cylindrical vessel *i*, is fitted with a piston *k*, against which, water from the boiler, exerts a force, when urged by any unusual pressure of steam in the chamber; this action causes the vertical rod *l*, to which the piston is attached, to rise, carrying with it one end of the lever *m*, having its fulcrum at *n*; the reverse end is consequently depressed, and, by the connection shewn through the rod *o*, closes the ventilation *p*. This apparatus is shewn in connection with that for feeding the boiler with water, when required; it will be seen thus:—The upper end of the rod *l*, working in an upright guide, and being attached to the lever *q*, will, by its ascent, bring down the opposite end of that lever, which, by union with the chain passing over a pulley, as shewn, will open the valve *c*, for the admission of water into the boiler.

The reverse action of this last-mentioned apparatus would, by this same connection, open the ventilator. This method of regulating the draft to the furnace, may, however, be employed quite independently of any other mechanism; in which case, the ventilator *p*, would have to be opened by the attendant.

Q, is a plate for increasing the length of the furnace, and for dividing the draft to the front and back-bars R, and S. The partition beneath, is for the purpose of working the set of back-bars S, when required.

In fig. 5, a mode of regulating the draft is exhibited, somewhat different in form from that just described; it consists of a plate, sliding upon pullies or bowls, which may

be drawn forth or slidden back, so as to shut out the atmospheric air from either one, two, or all three of the chambers below the fire-bars, at pleasure, and may be used simply by hand, or in connection with apparatus similar to that described above; there is also a flue, on each side of the upper fire-place, (one of which is shewn by dots in fig. 5,) communicating with one of the chambers under the fire-bars, by which air may be introduced. The mode of supplying and regulating the necessary draft in those furnaces, represented in the other figures, is in the ordinary way through the ash-pit.—[*Inrolled in the Rolls Chapel Office, October,* 1840.]

To THOMAS WELLS INGRAM, *of Birmingham, manufacturer, for certain improvements in shears and other apparatus for cutting, cropping, and shearing certain substances,—being partly a communication.*—[Sealed 7th October, 1841.]

THESE improvements in shears and other apparatus, for cutting, cropping, and shearing certain substances, apply to several descriptions of instruments, apparatus, or machines, designed for cutting fibrous materials, such as shears or scissors, for cutting cloth, paper, and similar substances; snuffers for cropping the snuffs of candles; and chopping-machines for rags, ropes, junk, &c.; preparing for paper-making, and other uses.

The improvements in scissors, shears, and snuffers, consist in so forming their blades, handles, and connecting joints, that, in the act of cutting, one of the blades only, with its handle, shall be moveable, whilst the other blade, with its handle, remains relatively stationary.

In Plate XVII., fig. 1, is a plan of a pair of these improved shears or scissors; fig. 2, shews the same shears, the blades being open, as in the act of cutting.

The lower blade *a*, with its handle *b*, are formed in one piece, the under parts of which it may be desirable to make

straight and coincident, but that is not essential. The upper blade *c*, is alone moveable, working upon its fulcrum-pin *d*, fixed in the hilt of the stationary blade. The handle *e*, by which this moveable blade *c*, is actuated, turns upon a fulcrum-pin *f*, also fixed in the hilt of the stationary blade; and the blade *c*, and handle *e*, are connected by a link *g*, and joint-pins, to the extremities of what may be called the shorter arms of these levers, that is, the blade *c*, and handle *e*. It will hence be perceived, that by raising the handle *e*, the blade *c*, of the shears will be raised or opened, ready for cutting, and that by depressing the handle *e*, the blade *c*, will be brought down, as in the action of cutting; the lower blade *a*, and handle *b*, having remained quiescent. In order to bring the cutting edges of the two blades together, with any pressure that may be required, an adjusting screw *h*, is inserted into the back of the hilt of the fixed blade, which screw acts upon a small elastic plate or piece *i*, let into a groove in the blade *a*, and held by a dove-tail at bottom; so that, by turning the screw *h*, the plate *i*, may be made to press with greater or less force against the back of the tail part of the blade *c*, and thereby force the cutting edge of the moveable blade against that of the stationary blade.

A modification of the form and construction of the joints or connecting parts of the blade *c*, and handle *e*, is represented in the elevation of another pair of shears or scissors, at fig. 3.—Instead of the link *g*, by which the two levers *c*, and *e*, were connected, as above described, there is, in this instance, a tooth or round part *x*, at the tail end of the blade *c*, which is intended to work in a corresponding recess or curved notch *y*, at the end of the handle *e*. When these two are mounted upon their fulcrum-pins *d*, and *f*, fixed in the hilt of the blade *a*, the recess *y*, acts upon the boss *x*, and, by leverage, causes the blade *c*, to rise and fall. A similar tightening screw *h*, is applied to the back of the plate or piece *i*, for the purpose of giving such lateral pressure against the tail-piece *x*, as shall cause the cutting edges of the blades to be brought together.

The same constructions of joints may be adapted to

snuffers, nippers, and other similar kinds of cutting or cropping implements. Fig. 4, represents a top or horizontal view (partly in section) of a pair of snuffers, the cutting chap of which is worked by similar means to those shewn in fig. 3. In this figure, the thumb-lever or handle *e*, is moved outward, and the chap *c*, thrown open, as in the act of snuffing. It will be unnecessary to explain the construction and action of the connecting parts or joints of these snuffers, as that is clearly shewn in the drawing, and has been fully described above.

Another modification of the mode of tightening or pressing together the blades of shears, is shewn in the detached figure 8, where the pin *d*, which forms the axle of the moveable blade, extends on each side of the shears, and a helical spring is enclosed within a cap, screwed on to the end of the pin, which presses the blades together. Fig. 9, represents another kind of spring, shewn formed as a disc at fig. 10, with radial cuts or openings. This disc is inserted into a recess in the hilt of the blade, fig. 9, and is held in its place by a screwed pin, which is the axle of the moveable blade.

The machine for chopping rags, ropes, junk, and other fibrous materials, in preparing them for making paper, and other purposes, is shewn in the drawings, in several views. Fig. 5, is an elevation of the machine, as seen in front; fig. 6, the same, as seen on the side; and fig. 7, a sectional elevation, taken through the middle of the machine, in the same direction as fig. 5. *a, a*, are the side standards of the machine; *b, b*, a transverse piece, connecting the sides together, and which forms the box and guide of the cutter-frame. The main rotary axle or shaft *c, c*, is actuated by a band and rigger, and governed by a fly-wheel *d*. The middle of the shaft *c*, is formed as a crank, to which the plunger *e*, is attached, that carries the bolt *f*, of the cutter-frame *g*. Two excentrics *h, h*, carry the rods *i, i*, that work the levers *k, k*, to which the driving-clicks *l, l*, of the ratchet-wheels *m, m*, are attached, for feeding the rags into the machine. An endless creeping-band *j, j, j*, is tightly distended over rollers *n, n*, as shewn in fig. 7; which band

passes over the top of a roller *o*, mounted in plummer-blocks, in the roller-frame *p*, *p*, and upon the upper surface of this endless band the rags are placed to be cut. Another roller *q*, is mounted in the same frame *p*, above the former, which roller carries a smaller endless band. Between these two endless bands, the rags are guided and carried forward toward the cutter. The excentrics *h*, *h*, at every rotation, by means of their rods *i*, *i*, lift the levers *k*, *k*, and cause the clicks *l*, *l*, to draw the ratchet-wheels *m*, *m*, round the distance of one tooth at every operation, which movement gives rotary motion to the roller *o*, and thereby advances the endless feeding-band *j*, at intervals, with the rags, toward the cutter. At one end of the axle of the roller *o*, there is a toothed-wheel or pinion *r*, taking into the teeth of a similar pinion, on the end of the axle of the upper feeding-roller *q*, as shewn in fig. 5, (though in this figure the roller *q*, is represented broken, for the purpose of shewing the parts behind,) consequently the two rollers *o*, and *q*, and their feeding bands, are made to move together in opposite directions, and, as they revolve, to conduct the rags toward the cutter. This movement of the feeding-band *j*, *j*, is further assisted by a roller or pulley *s*, at the other end of the axle of the roller *o*, from whence an endless band passes to a similar roller or pulley, on the end of the axle of the larger band-roller, not shewn in the drawing.

In order that the rags may be fed to the cutter, uniformly, at certain intervals, and confined whilst cutting, a sliding presser *t*, is made to rise before the rags advance, and afterwards to come down upon them and hold them compactly, (as seen in fig. 7,) during the descent of the cutter. This rising and falling movement of the presser *t*, is effected by a bridge-piece *u*, *u*, extending across the machine, near the cutter, and affixed to the back of the presser *t*, by bolts, as shewn in fig. 5; which bridge-piece is connected, at its ends, to anti-friction rollers *v*, *v*, seen in figs. 6 and 7. The ends of the bridge-piece *u*, terminate in small axles, which pass through large slots, cut in the levers *k*, *k*, as represented by dots in fig. 6; and the rollers

v, v, are attached to the outer ends of these axles. Under the roller *v, v,* powerful springs *w,* act, for the purpose of raising the rollers, and with them the bridge-piece *u,* and presser *t,* whilst the rags are moving forward toward the cutter; but when the excentrics *h, h,* and their rods *i, i,* depress the levers *k, k,* then the tops of the slots in *k, k,* come down upon the ends of the bridge-piece *u, u,* and cause it to descend, and bring down the presser *t,* upon the rags, as represented in fig. 7, by which the rags are held firmly, whilst the cutter is in operation.

The following is the method in which the cutter is actuated:—The middle of the main shaft *c,* is formed as a crank, and this crank is connected to the plunger *e.* This plunger, by means of jointed links, carries the bolt *f,* into the lower end of which the cutter-frame *g,* is screwed. The rotation of the main shaft, therefore, causes the plunger-bolt and cutter-frame to rise and fall with reciprocating movements. The descent of these parts, at the moment when the feeding is at rest, causes the edge of the moving cutter *x,* fixed in the frame *g,* to pass the edge of the stationary cutter or ledger-blade *y,* fixed to the bed of the machine, and in so doing to chop or cut off so much of the rags, rope, junk, or other materials, as have been protruded through the opening between the two cutting edges, by the feeding operation, when the moveable cutter was raised. The rags, &c., thus cut off, fall down through the opening, in the bed of the machine, into a suitable receiver below, and are thence taken to be washed and beaten into pulp, in the ordinary way. The back of the frame *g,* extends downward and forms a guide to the moving cutter, at the back of which an adjustable bar *z,* is placed. This bar being pressed forward by screws, keeps the moveable cutter *x,* in contact with the stationary cutter or ledger-blade *y,* and at any time may be adjusted, as circumstances require.

Another mode of feeding the rags into a cutting machine, is shewn in fig. 11, which represents, in sectional elevation, so much of the cutting machine as may be necessary, to illustrate its action.

The parts of this machine, as respects the cutter and its appendages, are the same in construction and action, as before described, the feeding alone being different. The rags or other materials to be cut, are placed upon the endless feeding-band *j*, *j*, as before, and are advanced toward the cutter by the rotation of the feeding-rollers *o*, and *n*, which may be effected in any convenient way. By the advance of the endless band *j*, *j*, the rags are brought on to the bottom of a trough A, immediately in front of the cutter *x*. Let it be supposed that the rags, &c., now occupy the bottom of the trough A, the pressing-plate B, attached by a joint to the end of the lever C, is to be brought down upon the rags, into the situation shewn by dots, which is effected by a sliding movement given to the pressing-lever. This lever C, is mounted upon a fulcrum-pin D, the ends of which are fixed in plummer-blocks, sliding in long slots, cut in the standards E, as shewn by dots. The longer arm of the pressing-lever C, is connected by a rod F, to a forked arm G, attached to the rings which embrace the excentrics or arm *h*. It will hence be perceived, that as the main shaft *c*, revolves, its crank will cause the bolt *f*, and cutter-frame *g*, to be raised and depressed, as before described; and the cutter *x*, in passing the ledger-blade *y*, will chop or slice the rags, &c., advanced from the trough A, and protruded through the opening. The excentrics or cams *h*, *h*, are so fixed on the main shaft, that before the cutter *x*, is brought down, they will cause the excentric rings G, and rod F, to draw the pressing-lever C, forward into the position shewn by dots, and the plate B, down upon the rags, in the trough A; in doing which, the axle or fulcrum-pin D, with its plummer-blocks, will be slidden in the long slots of the standards F, and the pressing-plate B, at the end of the lever C, will be brought forward, so as to protrude the rags through the opening between the cutters.

It is only further necessary to observe, that in order to allow for any inequality in the thickness of the mass of rags, or other materials, in the trough A, some elasticity must be given to the rod F, which connects the end of the pressing-lever to the excentrics or cams *h*, *h*. This is done by form-

ing the connecting-rod F, as a piston, working in a socket, in the forked arm G, of the excentric rings, and inserting, into the socket, a helical spring, sufficiently strong to produce the required pressure on the rags.

The advance of the plummer-blocks and fulcrum-pin D, may be made the means of feeding-in the rags, by connecting to this pin a long rod H, having a claw at its end, acting upon a ratchet-wheel, fixed on the axle of the feeding-roller *n*, by which means, every time that the presser-lever is advanced, the endless band *j*, *j*, with the rags, &c., will be moved onward also. As the pressing-lever C, with its plate B, recedes from the cutter, (aided by the helical spring K,) the hinder part of the plate will be raised by the power of a tongue-spring I, which enables the plate to slide back over the mass of rags, and prevent their being dragged away from the cutter.

The patentee claims, firstly, the peculiar constructions of the joints and connecting parts of the moveable chaps and handles of the shears, scissors, snuffers, or other cutting, cropping, or nipping apparatus, as shewn in the drawings, and the adaptation of the same contrivances to other similar kinds of apparatus, whatever may be their general forms or fashions; secondly, the arrangements and constructions of the parts of a machine, for chopping or cutting rags and other fibrous materials, for paper-making and other uses, as exhibited in the accompanying drawings; and thirdly, the means or methods of tightening or pressing together, and adjusting the cutting edges of the several scissors, snuffers, shears, and other cutting apparatus, as shewn in the drawings, and described above.—[*Inrolled in the Petty Bag Office, April,* 1842.]

Specification drawn by Messrs. Newton and Son.

To STEPHEN GOLDNER, *of West-street, Finsbury-circus, merchant, for improvements in preserving animal and vegetable snbstances and liquids.*—[Sealed 8th March, 1841.]

THIS invention consists in a mode of driving out the atmos-

pheric air from the cases in which animal and vegetable substances, and the liquids produced therefrom, are to be preserved.

This is effected by placing the cases in troughs, containing a solution of muriate of lime, or nitrate of soda, and then heating the solution by steam; by which means, an equal temperature is maintained, and the air expelled, without any danger of the substances in the cases being burnt, as frequently occurs when the cases are heated by stoves or ovens.—[*Inrolled in the Inrolment Office, September,* 1841.]

To LAURENCE KORTRIGHT, *of Oak Hall, East Ham, in the county of Essex, Esq., for certain improvements in treating and preparing the substance commonly called whalebone, and the fins and such like other parts of whales, and rendering the same fit for various commercial and useful purposes,—being a communication.*—[Sealed 17th March, 1841.]

THIS invention consists in an improved process of treating and operating upon strips or pieces of whalebone, in order to compress them in width, and thereby increase their thickness, so as to render that material applicable for forming walking-sticks, whip-handles, parasol and umbrella-sticks, ram-rods, archery-bows, and many other articles of common use, to which such strips or pieces would not otherwise be applicable; and also in new or improved machinery or apparatus for effecting the compression of the said strips of whalebone.

It is well known that whalebone is generally sold by the merchant to the manufacturer, in bundles of long strips or pieces, or as they are split from the fin; and the breadth of these pieces greatly exceeds their thickness. It is but seldom (when so split or separated from the fin or mass) that any piece or strip can be obtained, of sufficient thickness to form any of the articles above mentioned; and even

when this may happen to be the case, the middle parts of such pieces are found to be of a different quality, and more porous, or less compact than the outsides; whereas, by this invention, these pieces are pressed edgewise, which condenses all the parts into a round oval or other form, and when properly dressed and polished, will be applicable to the above-named purposes.

The strips of whalebone being first assorted, as to length, thickness, and breadth, are then placed between two laths of wood, or other suitable substance, and the whole is slightly bound together, and then introduced into a steam-tight tube or box, open at one end, and in immediate connection with a steam-boiler, placed over a suitable furnace, and supplied with water, as required, by means of a force-pump, or other means, and also a safety-valve and steam-gauge, if thought desirable. The steam-box or tube may be placed either horizontal or vertical, or at any required angle, and its other end closed, by a steam-tight lid or cover, capable of being opened and closed at pleasure, in order to introduce or remove the strips of whalebone, which, being confined between the laths of wood, are submitted to the action of the steam, for the required space of time, according to their size or thickness, so as to render them sufficiently soft for the next operation, viz., that of compressing. The steam acts on the wood and whalebone at the same time, and by softening the wood, renders it more fit for this purpose.

The compressing machine, represented in Plate XVII., consists of a table or bed, having strong arches thrown over it, with powerful levers, their longer arms being connected to chains or ropes and windlasses, and their other or shorter ends acting upon one or more presser-bars, placed over the opening or space, between two moveable side-chaps or clamp-bars, lying upon the table or bed of the machine. Between these two side-chaps, the strips or pieces of whalebone are placed, and these side presser-bars are brought together by any suitable mechanical agents or means, so as to prevent the bending of the pieces of whalebone edgewise, while they are being compressed; and, if required,

these side presser-bars may be allowed or caused to move apart, during the operation of compression, in order to allow for the expansion of the whalebone in breadth, during its compression, in the other direction.

Fig. 1, is a longitudinal elevation, in section, of one construction or arrangement of compressing machine; fig. 2, is a partial plan or horizontal view of the same; and fig. 3, is a transverse or cross section, taken vertically in front of the middle lever of the machine, or in the line a, b, in fig. 1.

a, a, is a strong bench or table, composed of wood or metal, supported on legs, or by any other suitable means; *b, b,* is a metal plate, forming the top or slab of the bench; *c, c, c,* are strong metal arches, through which the table *b,* is passed, the arches embracing or encompassing the bed. Upon the bed are placed the side-pressers or clamp-pieces *d, d,* and the vertical presser-bar or bars *e, e,* which are brought down by the force or leverage of the shorter ends of the powerful levers *f, f*, f.* The ends of these levers are formed cam-shaped, or as excentric wedges, and when forced forwards, they act between the under side of the arches *c,* and the top of the presser-bar *e,* and in depressing it, cause the material or whalebone, placed underneath, to be compressed. The outer ends of these levers *f,* are connected by suitable strong chains or ropes *g,* to a powerful windlass, in order to draw them down, and force their reverse or wedge-formed ends between the under side of the crown of the arches *c,* and the top of the presser-bar *e,* which causes the levers to depress the bar *e.* To the outer ends of these levers *f,* are also attached other cords or chains *h,* passing upwards over pullies, (placed above,) having counter-balance weights at their ends, in order to draw up the ends of the levers *f,* when the windlass or capstan is let go, and the pressure removed from the material under operation. The ends of the shorter arms of the levers *f,* are attached or connected to the upper part of the arches *c,* by connecting links or hooks and eyes, as at *i, i,* and serve to keep the ends of the levers in their proper places, which are also further guided by the side-plates or pieces *k, k,* fixed within the arches. The wedge-formed ends of the

two outer levers *f*, *f*, are also connected, by means of the link-pieces *l*, *l*, to the presser-bar *e*. In this machine, the side-pressers *d*, *d*, are represented as forced together, by means of wedges *m*, *m*, *m*, placed between them and the upright standards of the arches *c*; but other means may be used, as hereinafter shewn and described.

The operation of the machine is as follows:—The pieces of whalebone having been softened, by steam, in the process above described, are placed together, with the wooden laths, edgewise upon the surface of the table or plate *b*, and between the two side-pressers or bars *d*, *d*, (see fig. 3,) which are opened to receive the material, by knocking or forcing back the wedges *m*, *m*. The levers *f*, *f*, being raised, together with the vertical presser-bar *e*, through the connecting-links *l*, by means of the counter-balance weights, attached to the chains or cords *h*, as before named.

On the introduction of the laths and material into the press, the side-bars *d*, *d*, are made to approach each other, by forcing in the wedges *m*, *m*, which may be done by striking with a hammer, or other means. The inner edges of the side-bars are, by these means, brought into contact with the laths, and press them upon the material under operation. When the whalebone is thus situated in the machine, and supported by the side-bars *d*, *d*, the windlasses are put in motion by any suitable means, which, by the agency of the cords *g*, draw down the levers *f*, and force their shorter ends between the under side of the arches *c*, and the top of the vertical presser-bar *e*. By these means, the bar *e*, is pressed downwards upon the material with great force, the wooden laths giving way to the lateral pressure of the whalebone. After the material has been thus submitted to the required pressure, for a sufficient length of time, according to the size of the pieces under operation, the material may be removed, and a fresh charge of whalebone introduced into the press, and the above-described operation repeated.

Fig. 4, represents an end view of a press or machine, wherein screws are to be turned by levers, to give the pressure both downwards and sideways; fig. 5, is a partial

side, and fig. 6, a top view of a machine, wherein excentrics and levers are applied for the same purpose. The screws *o, o*, in fig. 4, and the excentrics *p, p*, and screws *o, o*, in figs. 5 and 6, answer, in effect, to the levers *f*, and wedges *m*, in the former figures. The excentrics *p, p*, are or may be mounted on axes or shafts, turning in suitable bearings in the frame-work or in the arches *c*, and the levers are to be connected to the excentrics or their axes, in any suitable manner.

Instead of the above-described apparatus, steam or hydraulic power may be employed, to effect the required compression of the material, such elastic force operating upon suitable pistons, placed in cylinders, and connected with followers, or rams, or rods, acting upon the presser-bars.

The patentee claims, first, the process, method, or means, above described and set forth, of operating or acting upon strips of the article generally called whalebone, for the purposes above named; and secondly, the machinery, press, or apparatus, for effecting the said operation of compression. —[*Inrolled in the Petty Bag Office, September*, 1841.]

Specification drawn by Messrs. Newton and Son.

To JOSIAH JOHN GUEST, *of the Dowlais Iron Works, in the county of Glamorgan, Bart., and* THOMAS EVANS, *of the same place, agent, for certain improvements in the manufacture of iron and other metals.*—[Sealed 28th May, 1840.]

THIS invention relates to the manufacture of iron, and the alloys of copper and iron, and tin and iron.

The first improvement consists in forcing a jet or jets of steam into the melted metal, whilst it is being operated on in the puddling and refinery furnaces. In the puddling furnace, the steam is forced into the metal, when it is in a state of fermentation, through four telescope tubes, which pass through the roof of the furnace. These tubes are three-quarters of an inch in diameter, and consist, as their

name would imply, of several parts, which, sliding over one another, allow the ends of the tubes to be moved to any suitable distance from the surface of the melted metal. The steam is supplied from a steam-boiler, or generated in the chimney of the furnace, and is used at a pressure of about 15 lbs. to the inch.

After the pig iron has become melted in the refinery furnace, the steam is introduced through the tuyeres, by means of four pipes, half an inch in diameter, and is employed at a pressure of about 20 lbs. to the inch.

The second improvement consists in protecting the sides, bridge, and bottom of the puddling furnace, from burning, by the application of a kind of paste or composition, which is formed by introducing a quantity of steam upon the fluid cinders, after the heat is drawn, until they are brought to the consistence of paste; they are then raked against the sides and bridge of the furnace, to fill any cavity that may have been burned during the previous operation of puddling the iron.

The patentees claim the use or application of steam, forced upon, or into, or in contact with, the melted iron, in refinery or puddling furnaces, for the manufacturing of the same; also the similar use of steam, in the process of melting or manufacturing alloys of copper and iron, and of tin and iron, in such furnaces; likewise the application of steam to fluid cinders, to produce the paste above described, and the use or application of the paste, as aforesaid.—[*Inrolled in the Rolls Chapel Office, September,* 1840.]

To JAMES FURNIVAL, *of Warrington, in the county of Lancaster, tanner, for an expeditious mode of unhairing, mastering, and tanning, various descriptions of hides and skins.*—[Sealed 29th March, 1841.]

THE first improvement consists in unhairing and mastering hides and skins, by enclosing them in an open frame-work, or in a cylinder, on the inside of which four or more longi-

tudinal beams are fixed, at equal distances apart, for the purpose of giving an uneven motion to the liquors used for unhairing and mastering, the skins being introduced into the cylinder, through an opening in the side, covered by a grating. The frame-work or cylinder is placed in a pit, containing the liquor, in such a manner, that two-thirds of it is always immersed, and it is caused to make ten revolutions in a minute, during the process of unhairing, and from two to three revolutions in a minute, during the mastering process.

The second improvement consists in tanning hides and skins, by enclosing them in the revolving cylinder above mentioned, along with a suitable quantity of tanning liquor, the opening in the side being closed by a door instead of a grating. A set of five or six cylinders may be employed, containing liquor of different strengths; and in this case, the hides are shifted from one to the other, as the operation of tanning proceeds.

The patentee claims the apparatus, herein described, for thoroughly tanning hides and skins.—[*Inrolled in the Inrolment Office, July,* 1841.]

To Alexander Southwood Stocker *and* Clement Heeley, *both of Birmingham, manufacturers, for certain improvements in patten and clog ties, and other fastenings for dress.*—[Sealed 27th April, 1841.]

The first part of this invention relates to patten and clog ties, and consists in making them of metal plates, covered with leather, cloth, or other suitable material, having holes punched in them, as usual, for the screws or nails, by which they are fastened on the clog or patten; and also for the strings or ribbons that secure the clog or patten on the foot.

The second part of the invention relates to the manufacturing of hooks, for fastening ladies' dresses, which are so constructed as to prevent the hooks from coming out of the eyes, in which they are inserted, without considerable pres-

sure. It consists in forming one or two convex stops on the plate of the hook, directly beneath the tongue, which is turned up a little, at its end, to allow the eye to slide over the stops easily; these stops retain the hook in the eye, and prevent their being accidently disengaged.

The patentee claims, Firstly.—The mode of manufacturing ties for pattens and clogs, by applying metal plates thereto, as herein described.

Secondly.—The mode, above described, of manufacturing hooks for fastening dresses.—[*Inrolled in the Inrolment Office, October,* 1841.]

To JAMES JOHNSTON, *of Willow Park, Greenock, Esq., for improvements in obtaining motive power.*—[Sealed 8th February, 1841.]

THESE improvements consist in working reciprocating engines, of any construction, by means of the explosive and condensive properties which oxygen and hydrogen gases possess, when exploded together.

The method of employing these gases, for working the engine, is as follows:—Into the cylinder, below the piston, (which is at its lowest position,) a quantity of the above-mentioned gases is admitted and exploded; this explosion forces the piston to the top of the cylinder. As soon as the gases have ceased expanding, they unite, and forming water, produce a vacuum below the piston, a very small quantity of water remaining at the bottom of the cylinder. The piston is now forced down to the bottom of the cylinder, by the admission and explosion of the gases above it, and a vacuum is produced in the manner above mentioned. Thus, by the alternate admission and explosion of the gases, above and below the piston, the engine is worked. The gases are admitted into the cylinder, in the proportions of one part oxygen to two of hydrogen.

The patentee claims the working of an engine, by the

joint action of the explosive and condensive properties, which certain proportions of oxygen and hydrogen gases possess, when exploded together.—[*Inrolled in the Inrolment Office, August,* 1841.]

To KENT KINGDON, *of Exeter, in the county of Devon, cabinet-maker, for his invention of certain improvements in impressing and embossing patterns on silk, cotton, and other woven or felted fabrics.*—[Sealed 21st April, 1842.]

THESE improvements in embossing consist, firstly, in producing, by means of flock, an embossed or raised pattern, on any unprepared woven surface of woollen, cotton, linen, or silk; secondly, in the use of a solution of India-rubber, by which means, the embossed or raised part, produced by the flock, is rendered more perfect and durable; and thirdly, in the employment of a solution of India-rubber, spread over the surfaces of linen, woollen, silk, or cotton, which solution, by preventing all absorption, admits of a gold size being spread on the surface, thereby enabling the cloth to be bronzed or gilt. The cloth, so prepared, is then passed under or between an engraved cylinder or cylinders, and the surface is thereby embossed, in the usual way.

The method of producing an embossed cloth, is as follows:—A piece of cloth, say woollen damask, quite plain, is printed or impressed with a solution of India-rubber, by means of a wooden or other block, the pattern required. When this is dry, flocking varnish, made in the usual manner, is printed with the same or a similar block, over the India-rubber; the flock is then dusted on the varnish, and when dry, the flock, by adhering to the varnish, forms the required pattern.

If the ground is intended to be gilt or bronzed, a solution of India-rubber is spread over a cloth, say a thin calico; when dry, it is coated with a gold size, made in the usual way, which may be either gilt or bronzed. The embossing can then be produced, by passing the gilt or bronzed cloth

between engraved cylinders, and if it is wished to form a pattern in flock, proceed in the way before described.

The patentee claims, firstly, the use of flock, for the purpose of embossing or forming raised patterns, on unprepared surfaces of woollen, linen, silk, cotton, &c.; and secondly, the application of India-rubber to surfaces of linen, woollen, silk, cotton, &c., which, by preventing all absorption, enables either the gold size or the flocking varnish to be applied, so that the surfaces, to which the gold size is applied, can be bronzed or gilt, and embossed by cylinders, in the usual way, and afterwards either flocked or not; or when the flocking varnish is used, the embossed pattern is produced, by means of flock alone.—[*Inrolled in the Petty Bag Office, October*, 1842.]

Specification drawn by Messrs. Newton and Son.

Original Communication,

BY

GEORGE LOWE, ESQ., C.E., F.R.S., &c.

To the Editor of the London Journal of Arts, &c.

Dear Sir,

I am quite sure your sense of justice and love of fair play, will cause you to give insertion to the following remarks on Dr. Ure's, Report on the Bude Light, which, so far as I can trace back, made its first appearance in print, in the pages of your May number, at a time when I was on the continent; I therefore did not become acquainted with its existence until months afterwards, when the periodical press were retailing it, in whole or in part, to their readers. I confess I was not a little astonished at reading the statement, contained in the third paragraph, as to the "formidable obstacles" encountered by Mr. Gurney, in the use of naphthalized coal gas, in connection with his Bude light patent for illuminating the House of Commons:—The Doctor says, (but I doubt not the words were put into his mouth, or rather his 'brief,') "Mr. Gurney then tried to illuminate the House with "naphthalized coal gas, in Argand burners, similarly supplied "with oxygen; and though this produced a light of sufficient in-"tensity, he encountered a formidable obstacle to its continuance, "from the deposition of liquid naphtha in the tubes of distribu-"tion." Now this 'coup de grace,' at my patent,* is either *true* or it is *false*, or partly the one and partly the other; the object

* For Report of this Invention, see Vol. XII., p. 137, of our present Series.

for which it was thrust so prominently forward in the Doctor's report, is too self-evident,—that of magnifying the herculean labours of Mr. Gurney, in the eyes of the public, but more especially in the eyes and votes of the "Select Committee, ap-"pointed to enquire into the remuneration due to Mr. Golds-"worthy Gurney, for his services in lighting the House of Com-"mons." With the evidence given before that Committee, which, for the future, has placed photometry amongst the '*exact* sciences,' we will not now meddle; my present object being simply to justify my patent from aspersions, rather than to shew up how ungratefully its services have been treated. This I will endeavour to do in the fewest words possible, making reference to the printed evidence, and to a bundle of letters, now before me, from Mr. Gurney, and the agents of the Bude Light Company; the object of nearly all which communications is the negociating for the use of my patent, and that too by a "Special License!!" which special license being refused, from that day, and henceforward, it has pleased Mr. Gurney and the Bude Light Company, to speak of the invention and its 'formidable obstacles' as in the present instance.

Let us take the facts in chronological order:—Certes,—the first edition of the Bude Light had run its race, when it was twice voted out of the House, in February, 1840; prior to which, 'coming events casting their shadows before,' I received a letter, dated January 14th, 1840, from Mr. Carter, a friend of Mr. Gurney, begging me to favour Mr. Gurney with a call, in No. 11 Committee Room, to help him out of his '*oxi-oil*' difficulties, by the substitution of my naphthalized coal gas. Numerous were the visits now, of Mr. Gurney to my residence, to see this gas in practical operation, and additional expenses were incurred by me in fixing up experimental gas-meters, to demonstrate the relative quantities of carburetted hydrogen and of oxygen, to produce a given quantity of light, as compared with the un-naphthalized gas of commerce.

Let me now put in evidence Mr. Gurney's letter, of the 7th of February, 1840; it is short, pithy, and supplies the origin of the Bude Light Company,—we must have this entire, if you please:—

"4, Argyle Street,
"*February*, 1840.

"My Dear Sir,

"The naphthalized coal gas produces a most brilliant light, with oxygen. Money is to be made—something must be done—can I see you?

"Yours truly,
"Goldsworthy Gurney.

"P. S.—I tried the experiment last evening, and have to-day ordered the street gas to be laid on, for the clock of the Horse Guards."

Turn we now to the celebrated evidence (lucus a non lucendo) of Mr. Gurney, given before the Committee, on May 2nd, 1842. Mark the disingenuousness of all his replies to the questions, 'ready cut and dried,' from No. 27 to 38; (when, by the aid of my invention and assistance, he regained possession of the confidence of the House, during the Easter recess). See how he cloaks his friend's invention under the disguise of '*oil-vapour*,' especially No. 35.—"I consulted Mr. Faraday, and he wrote a letter, stating that the mode of substituting the flame of coal gas, *treated in the way I proposed*, was a preferable mode of producing the Bude light, and that it was attended with *no danger*."

This ungenerous system of keeping his friend's invention in the back ground, if not of its actual appropriation, went through the whole period of the session, as it does through the whole of his 'evidence;' and it is but too apparent with what success it operated on the minds of the Committee, when we read a paragraph, from their printed report, like the following:—"Occasionally, in this session, difficulties had occurred in procuring the necessary supplies of oxygen. In consequence of these difficulties, Mr. Gurney resolved to apply the knowledge which he had derived from experiments, commenced in 1822, and repeated in 1839," &c.

To keep up this disguise, slang terms were invented for the naphthalizing process. At the grand illumination of Lansdowne House, on April 4th, 1840, on the occasion of the Queen's visit, it was called "*the charcoal box*," whilst at the House of Commons it was styled "*the oil box*," and when a better supply of it was wanted, the order given was to "turn on more oil!!" The report given to the daily press was, "the oil being now vapourized instead of burnt by wick!!"

Can we now be surprised at the tone of Mr. Gurney's first day's evidence, in which not a single allusion is made to a naphthalizing process? or to that of his second examination, the chief purport of which seems to be the giving a farewell kick to it, as a reward for past services?

As the best proof that Sir John Scott Lilly, the real holder of the Bude patent, does not look upon my invention with such a jaundiced eye, I might refer to the printed prospectus sent forth in October, 1841, above twelve months after the period of the "formidable obstacle." It says:—"There can be little doubt, therefore, that with such advantages, the *Bude Light*, which is protected by the patents of Gurney, Lowe, &c., will be immediately adopted by all classes of society."

Who would suspect that the House was illuminated by the naphthalizing process, from the Easter recess until its adjournment in August? and it would have so continued but for Mr. Gurney's inability to obtain a special license. True it is that towards the end of the session, six months from the time of its introduction, he met with some difficulties from the deposition of

water and naphtha in the fittings. The only wonder is, that this obstacle did not take place long before. I warned him of its probability the first time I inspected his arrangements *in the roof* of the House. Again and again have I explained to him the cause of this temporary difficulty, arising solely from his placing the gas-meter, charged with water, in a very hot situation, instead of the cellar, a very cold one. The youngest apprentice in a gas-fitter's establishment could have told him that meters, so placed in bakers' shops, or other *warm* situations, are liable to have their " fittings," or tubes of conveyance, charged with deposited moisture, and where a more convenient situation cannot be obtained for the meter, then, syphons or receivers, for this water, are placed at proper intervals in the fittings. Here then, is " the head and front of my offending," as blazoned forth in the 'REPORT,' and of which, even to this very day, the most unwarrantable use is endeavoured to be made at the numerous club-houses which have adopted my patent, during the last year and a half, with perfect success and satisfaction.

Here, Mr. Editor, I close my case, trusting very safely as to the verdict likely to be returned by your readers and the public. I will not tire them with extracts from letters through the years 1841 and 1842, up to the very time of Mr. Gurney giving his evidence on May 2d, when he stated his reasons for discontinuing what, without much vanity, I might call 'Lowe's Improved Bude Light,' to be the difficulty at times of procuring manganese, whilst on May 12th, he ascribes it to the 'formidable obstacle' of deposition; the real fact being, that the Gas Company would not accede to his unreasonable request of a special, instead of a general licence.

Believe me to remain,
Dear Sir, yours, &c.
GEO. LOWE.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 403, Vol. XXI.)

Mr. H. R. Palmer observed, that the form suggested by Colonel Jones, for the faces of breakwaters, did not appear sufficiently justified by observed facts; the idea was entirely of a speculative character, and was contrary to the laws of nature, which should be the engineer's chief guide. Many years ago, Mr. Palmer had occasion to study, very carefully, the motion of the shingle beach,

at the harbour of Folkstone, and at several other places, and the results of his observations were published in the Transactions of the Royal Society. He found that the slopes of the surface were always regulated by the force of the waves, and the angle at which they impinged; and that when the forces were at right angles with the line of beach, the whole of the pebbles were brought down below the level of the acting forces.

At Folkstone, when the sand was thus left bare, the surface stood at an angle of 9 to 1, and that slope resisted the force of very heavy seas.

The effect of the action of the sea upon an upright surface, was observable in every cliff upon the coast, and the tendency to destruction was everywhere obvious.

Shingle beaches might be considered as adjustable barriers, but in the construction of piers, it was necessary to adopt some precise form. When circumstances required the walls to be nearly vertical, the line of their direction should be determined with reference to the prevailing winds. Those portions of the piers of Swansea harbour, which formed even only a small angle with the prevalent winds, remained firm and substantial, but that part which was directly opposed, or at right angles to them, has been undermined. In a design of his, for a pier in Mount's Bay, at Penzance, Mr. Palmer had so arranged, that the angle of the main pier should be at 5° with the line of the greatest forces. Thus then, a horizontal slope is in fact made as a substitute for a rising one. He attributed the failures alluded to, by Colonel Jones, more to defective workmanship than to faults in the principle of the structure.

Mr. Palmer exhibited and presented to the Institution plans of Ramsgate, Dover, Folkstone, Swansea, and Penzance harbours.

In his observations of the action of the sea upon various parts of the coast, General Pasley had remarked, that the slope of the beach was exactly in accordance with the materials of which it was composed; if it was shingle, or decomposed rock, or soft material, the slope was gradual; but if the shore was rocky, the waves had not any serious effect upon the bluff face opposed to

them, except in the case of chalk cliffs. He conceived, therefore, that a perpendicular wall, constructed of large ashlar work, well cemented, would assume the character of a rock, and all the prejudicial action of the receding wave would be avoided.

Mr. Bull stated, that the banks of the river Calder, in Yorkshire, had been effectually secured from damage, by means of stone pitching or setting, laid at an angle of from 45° to 50° with the horizon, and resting on a mass of stone, thrown into the bed of the river, below the level of the water in dry seasons. These loose stones had generally been laid at an inclination of about 25° or 30°, where the depth, at low water, was not great, but where the water was deep, the lower part of the slope had been made at about 45°, returning at the upper part, or near the surface of the water, to the former angle of 25° or 30°. The pitching, composed of oblong stones, was laid in courses, with nearly vertical joints, having the least sectional area exposed to the action of the flood-waters. The stones were from 15 to 20 inches long, varying in their widths, and were laid on a bed of gravel or soil; he preferred coarse gravel, as it was less liable to be washed out from behind the stones, which sometimes occurred with soil, unless it was of a strong clayey nature. Several miles of facing, done by him in this manner, had now been standing between seven and nine years without requiring any repairs. In a few instances, when the loose stones at the foot had been either insufficient in quantity, or so small as not to resist the action of the floods, and had been washed away, the pitching had slid down into the bed of the river, without being otherwise disturbed: after it had settled, the top part had been renewed, and the original line restored.

The floods in the river Calder frequently rose from 8 feet to 12 feet, and flowed with a very rapid current; consequently, the pitching had to resist a powerful action, particularly at the concave side of a bend in the river, where the action was both directly upon and along the face of the work. The loose stones, below the low-water mark, were seldom disturbed by the floods, and where they had been removed, no damage had been sustained

beyond the sliding down of the pitching, as before described; such, however, had not been the case where, from peculiar circumstances, a perpendicular or nearly perpendicular wall had been built instead of the pitching; in such instances, a slight disturbance of the loose stones had frequently caused the destruction of the wall. Where the pitching had been backed with light soil, which was easily washed out through the joints, the stone-work had fallen into holes, as might be expected, but where a good strong gravel had been used for the backing, no such instances had occurred.

Mr. Bull differed from Colonel Jones's opinion as to break-waters with a vertical or nearly vertical face, because any disturbance of the footing, however slight, must have a tendency to overthrow the wall, and that tendency would be in proportion as the angle of the wall diverged from the angle of repose; that is to say, if the wall was quite perpendicular, a comparatively small disturbance of the foundation, or footing, would destroy the equilibrium, and the superstructure would be overthrown; but the nearer the face approached the angle of repose, the greater would be the security.

He did not mean to assert that the angle of repose was the best for the face of a breakwater, or that the same angle should be preserved from below low-water mark to the top of the structure; on the contrary, he was inclined to think that a curved section, commencing from a few feet below low-water mark, at an angle of 10° or 15° from the horizon, and terminating at the top, at an angle of 70° or 75°, would be found a good form; and, if the courses of face-stones were laid nearly vertically, should the footing below low-water mark be removed by the action of the waves, the consequence would be a sliding down of the upper face, which could easily be replaced at the top, as is done with respect to the river pitching.

The proper angle for the loose stones below low-water mark, would, he had little doubt, be that of repose, or nearly so, as Colonel Jones had shewn to be the case in several existing breakwaters.

The face-stones should be roughly squared on the beds and joints, or what is called in the North, "scappled" to the form of the curve, and laid in equal courses, not quite perpendicular, but inclining a little from the direction of the prevailing wind, perhaps about 10° from the vertical line.

Mr. Bull was induced to offer these remarks, for the purpose of recording a practice he had successfully applied to the protection of river-banks (of which he presented drawings), and his opinion as to its applicability to the construction of breakwaters.

April 19th, 1842.

The President in the Chair.

"On the causes of accumulation of deposit in Sewers, and on the hitherto generally prevalent mode of removing the same; with a description of a new Flushing Apparatus, used for cleansing the Sewers in the Holborn and Finsbury Divisions."—By John Roe, Assoc. Inst. C. E.

In the Holborn and Finsbury Divisions, there are upwards of eighty miles of covered sewers, in a large proportion of which there were accumulations of deposit, which, by choking the side-drains and causing effluvia, became sources of much annoyance. The only remedy resorted to, was to raise the deposit to the surface of the street, and cart it away. This was for many reasons an objectionable process; and a careful examination of the sewers was ordered, when it was found that many causes of obstruction existed. In sewers of the same form and inclination, different degrees of accumulation existed. This was caused sometimes by a greater run of water in one than in the other; in other cases, although the flow of water was equal, the deposit was unequal; in some situations, openings having been made to insert side-drains, bricks had been left in the sewer, against which considerable deposits had formed. The admission of water from collateral sewers, at right angles and at different levels, had also caused obstructions to the continuous flow along the main line. An example is given where, although the collateral sewer was

3 feet above the level of the main line, a deposit of a foot in depth was formed for several hundred feet up the stream, while below the point of junction the sewer was perfectly clear. The insertion of gully-necks frequently caused obstructions, by permitting the access of dirt and rubbish from the road.

These facts being ascertained, the next consideration was how to remedy the defects, as the locality would not permit an alteration of level, which would give a flow through the sewers sufficiently strong to carry off the deposit. After a long series of experiments (by the author, who is engineer to the Commissioners), and trials upon several kinds of apparatus, the following arrangement was decided upon. An iron frame was set in the sewer, with a hinged door half its height, fitting with a water-tight joint; the door is opened and closed by means of a jointed rod, worked from the level of the street. A head of water is allowed to collect against the closed door until it is sufficiently heavy, when the door being suddenly opened, the whole mass of deposit is carried forward by the rush of water. The operation is repeated with a head of 3 feet of water at intervals of half a mile, until the whole of the accumulation issues at the outfall, thoroughly cleansing the sewer. After this arrangement of apparatus had been some time in use, an improved form, with side entrance, was contrived, and is now generally adopted in situations which admit of it.

By this simplified arrangement, the stop-gate can be worked without the mechanical contrivances of the other method, and an easy access is afforded to the sewers. This latter mode is generally adopted, and the success of the plan is stated to be perfect.

All the details of the construction of the stop-gates and the sewers, as well as of several improvements in the building of the gully-holes and collateral sewers, are given, with the result of the velocities of the currents of water from heads of various heights.

Drawings of all the several kinds of apparatus invented by the author were presented, and the models which were exhibited were explained by Mr. Burton, the manufacturer of the flushing apparatus.

Mr. Farey exhibited and described one of a set of Indicators for steam-engines, made by Mr. Penn, of Greenwich, for the French Government, to be used in trying experiments on the steam vessels in their navy.

The construction was the same as those made by Mr. M'Naught, of Glasgow; but the instruments were larger and better proportioned. Mr. Farey availed himself of the opportunity of describing the construction, the operation of, and the qualities required in a good Indicator, and then exhibited a series of Indicator cards, either taken by himself or by friends, whose accuracy could be depended upon.

They extended from the year 1817, at short intervals, down to the present time, and showed a great improvement in the application of steam in engines; in fact, Mr. Farey was of opinion, that the origin and progress of the modern improvements in engines might be traced by a series of cards, taken at various periods, and he promised to contribute a more extended communication on the subject, during the ensuing session.

April 26, 1842.

The President in the Chair.

"A description of a new arrangement for raising Ships of all classes out of water for repair; proposed to replace the Graving-Dock or the Patent Slip in certain situations; with observations upon the other methods used, at different periods, for this purpose."—By Robert Mallet, M. Inst. C. E.

This communication describes an apparatus, proposed by the author, as a substitute for the graving-dock or the patent slip, in situations where such constructions would be too expensive, or an inappropriate locality prevents their adoption. It reviews the principal methods hitherto in use,—such as stranding by bilge-ways, careening or heeling over, lifting by the camel, the graving-dock, the floating-dock or caissoon, the screw and the hydraulic docks, (both American inventions,) and Morton's patent slip; it enumerates the localities for which each of these inventions is

most applicable, and then gives the objections to them. The author then describes the general principle of his invention to be the diffusion of the load or strain over the greatest possible number of fixed points, avoiding casual and unequal strains; that there should be uniform motion, with a power proportioned to the resistance. In providing for this, the joggle-joint is used throughout. The machine consists of a platform, supported upon a series of frames with joints at each end, attached at the lower extremities to fixed points in the foundation, and at the upper ends to the under side of the platform, which is traversed by a series of beams, at the ends of which are fastened rods connected with rollers, working in grooves along a suspended railway, on the cantilevers of two jetties, which are built to form the sides of the apparatus. A chain, connected with all these rollers, traverses in each suspended railway-groove, and the power of a steam-engine and wheel-work, being applied after the vessel is floated on the platform and made fast, the frames raise the platform and vessel together gradually out of the water, permitting free access all round the ship; and when the repairs are completed, the whole is again lowered into the water. It is contended, that many practical advantages would arise from this system,—that the ship would not be strained,—that time would be gained,—and that it is superior to the ordinary methods now practised.

The calculations of the leverage, the division of the load over the fixed points, &c., are given in detail, and the paper is illustrated by a series of elaborate drawings, and a complete model of the apparatus.

Mr. Rendel thought that credit was due to Mr. Mallet for the science and the practical skill combined in the production of the contrivance under discussion. It was, perhaps, imperfect in some of the details; but he was inclined to believe that, in certain situations, and for vessels of moderate size, it might be adopted. Its construction would certainly be more expensive than that of a patent slip; but it would be less costly than a graving-dock,

and not liable to injury from hydrostatic pressure, to guard against which, frequently constituted a main portion of the expense of a graving-dock The foundation of this structure might be simple, as the weight was distributed over so many points; he conceived, however, that unless it was established where the rise of tide was considerable, the foundations must be laid at a depth of 5 or 6 feet under low-water mark, to allow for the thickness of the frames and the platform beneath the ship's bottom. He was of opinion, that a modification of the plan might be advantageously employed for canal lifts.

Mr. Hawkins agreed with Mr. Mallet, that a ship must be strained while on a patent slip, because the timbers were all bearing a weight at an angle, but more particularly when leaving the slip, as the stern floated whilst the stem was still on the cradle of the slip.

Mr. Palmer did not admit the advantages of the proposed plan over graving-docks, for, as they are now constructed, they possess every requisite convenience for examining and repairing vessels. The gates are made to exclude the water perfectly, and the machinery for pumping is so effective, that a very short time suffices to lay the dock dry. The plan might possess some advantage over Morton's slip, in retaining the vessel in a vertical position, but it would be more expensive to construct, and he was not at all convinced that the objections urged against the patent slip were well founded.

Mr. Gordon observed, that the position of a ship upon a patent slip, was exactly that in which it was built; he could not, therefore, understand why it should be so very injurious. Besides, if the stern cradles were elevated, as was the case on some of the slips proposed by Captain Brown, the vessel remained nearly on an even keel. Another improvement introduced by Captain Brown, was, substituting solid rollers for the wheels of Morton's slips, the axles of which frequently twisted and prevented the progress of the vessel.

Among the modes of examining the bottoms of vessels, enumerated by Mr. Mallet, he had omitted the " gridiron," which con-

sisted of a strong frame of horizontal timbers resting upon the heads of piles a little above low-water mark; over this frame the vessel was moored, and on the tide receding, was shored up, resting upon chocks. When it was dry, the bottom could be examined, and any slight repair made before the returning tide floated the ship off. "Gridirons" existed at Liverpool, at Havre, and at many other ports.

The President observed, that, like the form of breakwaters, much depended upon locality. Where timber was cheap, and the rise of tide considerable, the plan might be applicable; at Liverpool, where the tide rose 30 feet, and in the Channel Islands, where the rise was 40 feet, the platform might be 10 feet above low-water mark, and still accommodate any ordinary vessel. It certainly appeared to avoid some of the main expenses of the graving-dock, in which so many precautions must be taken for preventing the springs rising and blowing up the bottom. The Institution was much indebted to Mr. Mallet for the great pains he had bestowed on the communication, for the complete drawings and model illustrating it, (which were presented to the Institution,) and he deserved credit for the ingenuity displayed in the contrivance.

"Account of the Machinery and Apparatus for compressing and using Gas for Artificial Illumination, at the Portable Gas-works of London, Edinburgh, Manchester, and Paris."—By Charles Denroche, Grad. Inst. C. E.

This paper gives an account of the improvements introduced by Mr. David Gordon, into the syphon forcing-pumps, reservoirs, &c., whereby the requisite degree of compression was obtained for rendering gas portable for the purposes of illumination, and of the arrangements adopted in the works at Edinburgh, Manchester, London, and Paris. A description is given of the various kinds of apparatus which were tried before a pressure could be obtained of 30 atmospheres, or 450 lbs. per square inch. The portable lamps, with their ingeniously contrived graduated

cocks, are also described, with the several parts composing the apparatus. It appears that, owing to the cost of compression, which was three shillings and sixpence per thousand cubic feet, and that of delivery, which amounted to ten shillings per thousand feet, the speculation was unsuccessful, in a mercantile point of view, although most of the mechanical difficulties were overcome.

The paper was accompanied by a series of detailed drawings of every part of the apparatus.

Scientific Adjudication.

IN THE PRIVY COUNCIL,

Wednesday and Thursday, December 7th and 8th, 1842.

BEFORE LORD CAMPBELL, SIR HERBERT JENNER, DR. LUSHINGTON, AND MR. JUSTICE ERSKINE.

SIMISTER'S PATENT.

This was an application to the Judicial Committee of the Privy Council to grant an extension of the term of the petitioner's patent, of the 18th December, 1828,* for improvements in weaving, preparing, or manufacturing a cloth or fabric, and the application thereof to the making of stays and other articles of dress, which improvements are also applicable to other purposes. The application was opposed.

Mr. Hill, Q. C. and Mr. Webster, appeared for the petitioner; the Solicitor-General and Mr. Cowling for the opponents.

The grounds for the extension, as stated in the petition, were the expenses incurred in experiments, in perfecting the invention, and in taking out the patent; in stopping infringements; the opposition of the wholesale dealers of the stitched stays, and the prejudice created by reports that the patent stays would not bear washing; in consequence of which, the patentee was without any

* For Report of this Specification, see Vol. IX., p. 146, Second Series.

profits for eight years, until he succeeded in overcoming the prejudices, and introducing his stays into general use. That the whole of the profits of the invention during the last six years had not equalled the expenses incurred and losses during the preceding years.

The method of making stitched stays was described to be by securing together two pieces of fabric, and leaving the proper interstices for the back bones, wadding, and other materials used for the filling; the patentee wove the fabric in a loom, leaving the proper interstices according to the usual and general pattern of the stay; there was also certain cross stitching and stopping of the spaces, which was much relied on by the witnesses for the petitioner. The fabric thus produced was said to be of a more uniform character and texture than that made by sewing two pieces of cloth together. It appeared, in cross-examination of the witnesses for the petitioner, that double weaving, so as to have spaces, was old;—fabric so prepared having been long made and used for stiffeners, and that fabric which might be used for stays with suitable spaces, could be woven by power. But it appeared that no double fabric, suitable for stays, or having the proper spaces, both as to size and arrangement, had been made before the petitioner's patent; also that a fabric, made by power, would not have the drops or stops, and the cross-stitching, and would be generally inferior, for the purpose of stay-making, to that made by hand, and according to the petitioner's specification.

Several witnesses were called to prove the novelty and superiority of the patent stays; several imitations were produced which had been on sale during the last eighteen months. It appeared that the petitioner had been advised, prior to commencing proceedings against the manufacturers of these stays, to enter a disclaimer of those parts of his specification which were not applicable to stays, and that this had been completed but a few months before the petition for the extension was to be presented.

The selling price of the patent stays was about the same as of the stitched stays,—the saving on the cost of the fabric from 4*d.*

to 6*d.* per pair; and this was, consequently, taken as the measure of the profit. No witnesses were called in support of the opposition.

The Solicitor-General, on behalf of the opponents, contended that the prayer of the petition could not be granted, on the three following grounds:—1st, that there was not sufficient public benefit in the invention; 2nd, that there was no peculiarity in the situation of this patentee to entitle him to the extraordinary relief asked for; and, 3rdly, that there had been a degree of slumbering on his rights, and neglect in proceeding against infringements, which would effectually preclude him from succeeding in the present application.

With respect to the first ground.—In all cases which had hitherto occurred, of extension by the Privy Council, some sufficient ground, on the score of great public benefit and utility, had been laid before the Committee. Here the invention was of a trivial kind, possessing but very little novelty, and a small degree of utility. Weaving spaced fabrics were known before; anybody would apply such fabrics to stays. The fact of the slow progress of the sale shewed but a small degree of utility, and was itself an answer to the application. The public did not get their stays cheaper. What, then, was the public utility? As to the second ground, there were no peculiar circumstances connected with the patent, either of hardship or utility. The invention did not sell—this was a common case with many patents; but the petitioner had gone on for twelve years before he thought of entering a disclaimer. Thus, by his own admission, he had been in the enjoyment of an invalid patent for nearly the whole term of its natural duration. It was said that the parts disclaimed were not such as would have prejudiced the patent; but a patentee has no right to go on in this manner. The allegation in the petition, in respect of the peculiar circumstances of the trade and the opposition of the large wholesale houses, had not been supported; the petitioner had not only failed in proving the utility, but he had shewn no peculiar circumstances or expense not common to every patent. Now something of this kind must be shewn in every case for an extension.

Thirdly.—The petitioner had slumbered on his rights, and parties had been permitted to infringe with impunity. The patentee is proved to have known of these infringements, and no steps were taken. What would be the consequences of an extension, but that these parties would be immediately involved in litigation?

Mr. Hill, on behalf of the petitioner, offered to give any undertaking not to proceed against the particular party alluded to for part infringement.

Lord Campbell.—How can that be answered?

Mr. Webster suggested that it could be done by the insertion of a proviso in the new letters patent, as in the case of the extension of Whitehouse's patent for gas-tubes, where new letters patent were granted to Russell, the assignee. The security of an annuity of 500*l.* per annum to the original inventor, was recited in the new letters patent as part of the consideration of the patent; and a proviso was inserted, rendering the new letters patent void, if the annuity should not be duly paid. The Queen's warrant directs the Attorney-General to insert any proviso he may judge requisite.

After a short deliberation,

Lord Campbell said:—" Their Lordships are of opinion that no sufficient ground has been shewn for recommending to Her Majesty an extension of the term of the letters patent of the petitioner."

VICE CHANCELLOR'S COURT,

December 22nd, 1842.

MUNTZ *v.* GRENFELL.

This was a motion on behalf of the plaintiff, Mr. Muntz, M.P. for Birmingham, to restrain the defendants, Messrs. Grenfell and others, from using the alleged invention of the plaintiff, for making metal plates for sheathing the bottoms of ships and other vessels.

The counsel for the plaintiff were Mr. Wigram and Mr. Follett: for the defendants, Mr. Parker and Mr. Hetherington.

The facts appeared to be as follows:—

On the 22nd of October, 1832, a patent was granted to the plaintiff for this invention* ; and in September, 1835, the defendants, who were then copper merchants, entered into partnership with him, and, by the agreement, it was stipulated that the patent right should be vested in the plaintiff and defendants, jointly, for the remainder of the term; that the patent should be the joint property of the partners; and that, after deducting expences, and apportioning £2. per ton to the plaintiff for all metal made according to the patent, the profits should be divided, one moiety for the plaintiff, and the other for the defendants. Liberty was reserved for either party, by one month's notice being given, to put an end to the partnership. The plaintiff, at the commencement of the partnership, explained the mode of working his patent, and the sale of the metal-plates, so manufactured, was managed by the defendants, who, by this means, had possessed themselves of the goodwill of the trade.

In May, 1841, the defendants gave a month's notice to the plaintiff to dissolve the partnership, and on the 17th June it ceased accordingly, and the plaintiff received notice from the defendants to give up the mills in which the business had been conducted.

It was insisted that the patent was vested in the plaintiff, but that the defendants continued to work, make, and expose for sale, the composed metal as before, and for this reason the application to this court was made. He claimed the common right of a patentee, and even if the patent should, as the defendants alleged, be found invalid, he ought to be protected, considering the distinct contract which had existed between the parties; but whether the patent were good or bad, this was not the time to question it. The counsel for the plaintiff said, that Mr. Muntz was the party who had all the knowledge of the mode of working the patent, and that the defendants, having extracted from him that knowledge, and being entrusted with the management of the sale, possessed themselves of the whole of the trade, by which, if not

* For report of specification, see Vol. III. of our Conjoined Series, p. 212.

restrained, they would inflict irreparable injury on the plaintiff. Mr. Muntz was quite willing that his title should be tried at law, but in the mean time he insisted that his interests ought to be protected by a court of equity. The cases of "Bowman *v.* Taylor," 2 Adolphus and Ellis; "Hale *v.* Thompson;" "Bickford *v,* Skewes;" "Russell *v.* Cowley;" the case of "Oxford and Cambridge," in 6 Vesey; and "Hullett *v.* Haig," 2 Barnewell and Adolphus, 377, were cited.

Mr. Follett, in answer to a question from his Honour, said that the plaintiff was in a condition to prove that the patent had been infringed by the defendants, without any admission on the part of the defendants; for that they had issued circulars to the trade, in which they stated that, as untrue reports had been propagated as to the legality of their continuing the manufacture of these plates, they would be willing to indemnify any persons who might suffer any damage by dealing with them.

For the defendants, it was said, that the issue to be tried, was whether or not the present was a valid patent, ? a point which the defendants negatived. In the *Repertory of Arts,* they found, for the year 1804, a specification of a patent of a Mr. Collins, precisely like that alleged to be the invention of the plaintiff.

His Honour.—Was the plaintiff ignorant of the invention of Mr. Collins?

Mr. Parker.—Mr. Muntz says that he is the true and original inventor, and denies that his was the same as Collins' invention. The plaintiff's case is, that his metal is manufactured from "the best selected copper, an article of commerce not known at the time Collins obtained his patent." The patent of Collins consisted of "red, yellow, and white metals," all composed of copper and zinc, in different proportions, and the defendants allege that the second, "the yellow metal," was exactly the same as that of the plaintiff's alleged invention.

His Honour.—As both compositions consist partly of copper, I wish to know whether such copper as was used in 1804, will do for the purposes of Mr. Muntz's patent?

Mr. Wigram.—My case is that only "the best selected copper"

will do, and that that article was not known until within the last few years.

Mr. Parker proceeding, said that the second ground on which the defendants relied, was, that there had been no exclusive enjoyment of the patent—that is to say, uninterrupted enjoyment. The patent was never worked until September, 1837. The defendants paid Mr. Muntz £1,000. for his invention, and, therefore, if shortly after the agreement they had been aware of the invalidity of the patent, it would not have been consistent with their interest to state their opinion, at all events, until they found other parties infringing the patent. So early, indeed, as 1837, the defendants wrote to the plaintiff, saying, "The patent is all humbug." Before the dissolution of the partnership, a bill had been filed by the plaintiff and defendants against Messrs. Vivian, of Swansea, for an infringement of the patent, and Mr. Muntz had not then, as he might have done, tried his right at law. Infringements had also been proved to have been made by Lyon and Newton, and Mr. Freeman. The affidavit of Sears proved that "the best selected copper was smelted in exactly the same manner as the best cake or tithe copper, in the same furnace, at the same time, and by the same process; and that it was used, to his own knowledge, for many years before 1831." The defendants, therefore, insisted that the plaintiff was not entitled to the relief he prayed, but they were quite willing to account until the right could be decided at law.

Mr. Hetherington was heard on the same side.

His Honour.—The first question is, whether, for the limited purpose of the present interlocutory application, and as between these parties only, the patent is or is not to be taken to be valid? The utility of the process is not questioned. The specification has not been strongly attacked, and it appears that there has been a conviction on the part of the defendants that the invention is the plaintiff's, and that the specification is not insufficient. The main question is, as to the originality of the alleged invention. Now, how does that stand on the evidence? The patent is dated the 22d of October, 1832. Negotiations took place during the

following year between the plaintiff and defendants, for the purpose of working (as it is called) the patent in partnership together. That negotiation ripened into a contract on the 24th of September, 1835, by which the plaintiff and defendants agreed to carry on the business together for a term commensurate with the duration of the patent, subject to the notice for dissolution which has been mentioned. The articles of agreement, though not in precise terms, recite the validity of the patent, proceeding upon the notion that they were dealing with a valid patent. In 1835, the specification of an expired patent was observed in a scientific publication, which was brought to the attention of the plaintiff and defendants as being likely to affect the validity of the patent in which they were jointly interested. On that occasion, the plaintiff in substance offered the defendants to close his connexion with them, if they were dissatisfied. This offer was refused, and the partnership went on as usual until May, 1842, when the parties, not being able to agree (why, was not shown), notice of dissolution was given by the defendants to the plaintiff, in accordance with the articles of agreement. On the 17th of June, 1842, the partnership expired, the result of which was to revest the patent wholly in the plaintiff. Some time before this, Vivian was supposed to have infringed the patent, and a bill was filed against him in this court by the present plaintiff, and the defendants jointly, as co-plaintiffs, and an injunction was moved for.* That suit was conducted by the private solicitor of the present defendants, as I collect, and they used, as a main part of the materials on which they applied for the injunction, an affidavit, made by Mr. Muntz, in which he swore precisely as to the originality of the invention. Under these circumstances, can I, for the present limited purposes, and as between the present parties, refuse to let this injunction go? If I were of opinion that I ought so to do, then the question of enjoyment or disturbance becomes of less importance than otherwise it would be. It appears that the plaintiff, from the first, has manufactured sheathing from his patented plan. He endeavoured to make his invention

* For an account of this injunction, see Vol. XIX., Conjoined Series, p. 460.

public for the purpose of selling it. It appears that there existed a strong impression in the trade against it; and, as it would appear, from prejudice and ignorance of its real merits, for no one seemed to dispute that it was a meritorious invention. At first, therefore, it had no considerable sale; but in 1837, the patent appeared to be set actively at work, and was more known and taken up by the trade. Between 1838 and 1811, there was an attempt made to invade it by a party named Cutler, but he soon desisted. There are only three instances of infringement—one by Vivian, another by Lyon and Newton, and a third by Freeman. Against this there is that species of enjoyment by the plaintiff which has taken place to the extent before mentioned, previously to the partnership, and a substantial, full, and complete enjoyment during 1838, 1839, and 1810. Considering, therefore, if the view I take be correct as to the manner in which I have, for the present purpose, treated the question of the validity of the patent, I think I must consider the infringement as a slight disturbance. I shall, therefore, order the injunction as between the present parties, the plaintiff undertaking to abide by such order as the Court may think fit as to compensation, and undertaking immediately to bring his action to try the question of the validity of the patent; the trial to be in Middlesex; the plaintiff to commence within a week, unless prevented by the defendants, and to deliver the declaration in three weeks.

List of Disclaimers
OF PARTS OF INVENTIONS AND
Amendments
MADE UNDER LORD BROUGHAM'S ACT.

From the frequent disclaimers of portions of patented inventions, which are, from time to time, allowed by the Attorney and Solicitor-General, under the new Act, it has become difficult, in many instances, to obtain, from the specification, an exact knowledge

of the features of novelty intended to be held by patentees. We have, therefore, thought it desirable to lay before our readers an official list of all disclaimers and amendments to the titles and specifications of patents which have been granted since the passing of the Act, in order that parties concerned in similar inventions, may (being aware of an alteration,) be enabled to refer to the documents which will be found attached to the roll with the specification.

Although we do not consider these documents of sufficient general interest to publish verbatim in our Journal, yet believing the list of disclaimers and alterations to be an *useful feature*, we shall, when publishing an amended specification, direct attention to that amendment, by note or otherwise.

Benjamin Rotch,—disclaimer and memorandum of alterations to patent dated 20th March, 1830, for "improved guards or protections for horses' legs and feet, under certain circumstances." Filed 22d December, 1835.

John Cooper Douglas,—disclaimer to patent dated 19th November, 1833, for "certain improvements which prevent either the explosion or the collapse of steam and other boilers, from an excess of internal or external pressure." Filed 8th January, 1836.

Charles Jones,—ditto to patent dated 12th June, 1833, for "a new arrangement of additions to, and alterations in, certain parts of gun and pistol locks." Filed 26th January, 1836.

Stephen Perry, Edward Massey, and Joseph Gauci,—ditto to patent dated 20th September, 1834, for "certain improvements in pens and pen-holders." Filed 30th April, 1836.

William Losh,—ditto to patent dated 31st August, 1830, for "certain improvements in the construction of wheels for carriages, to be used on railways." Filed 27th May, 1836.

William Symington,—ditto to patent dated 7th November, 1835, for "certain improvements in the machinery for propelling vessels by steam, parts of which are also applicable to motive

machinery of other descriptions, whether actuated by steam or by any other moving power." Filed 10th June, 1836.

Miles Berry,—ditto to patent dated 5th October, 1833, for "certain improvements in the construction of weighing-machines." Filed 2nd August, 1836.

Alexander Stocker and William Southwood Stocker,—ditto to patent dated 22nd October, 1832, for "various improvements in machinery for manufacturing iron and other metal tips, for the heels and toes of shoes, chain-links, and other articles." Filed 9th August, 1836.

Charles Derosne,—ditto to patent dated 29th September, 1830, "for certain improvements in extracting sugar or syrups from cane juice, and other substances containing sugar, and in refining sugar and syrups." Filed 11th August, 1836.

Thomas Earl of Dundonald,—ditto to patent dated 5th November, 1835, for "improvements in machinery and apparatus, applicable to purposes of locomotion." Filed 18th October, 1836.

William Crofts,—ditto to patent dated 18th December, 1832, for "certain improvements in machinery for making lace or net, commonly called bobbin net lace." Filed 22nd March, 1837.

William Crofts,—ditto to patent dated 20th November, 1834, for "certain improvements in machinery for making lace or net, commonly called bobbin net lace." Filed 22nd March, 1837.

Joseph Whitworth,—ditto to patent dated 19th November, 1836, for "certain improvements in machinery for spinning and doubling cotton, wool, and other fibrous substances." Filed 22nd May, 1837.

John Read,—ditto to patent dated 19th August, 1833, for "certain improvements in machinery or apparatus for raising or forcing fluids." Filed 15th July, 1837.

Joseph Nye,—ditto to patent dated 2nd June, 1835, for "improvements in pumps and instruments or apparatus for conveying fluids into and withdrawing them from cavities of human and other animal bodies, part of which improvements are also applicable to other pumps." Filed 24th August, 1837.

Henry Stephens and Ebenezer Nash,—ditto to patent dated 18th April, 1837, for "certain improvements in manufacturing coloring matter, and rendering certain color or colors applicable to dyeing, staining, and writing." Filed 22nd September, 1837.

John Hanson and Charles Hanson,—ditto to patent dated 31st August, 1837, for "certain improvements in machinery or apparatus for making or manufacturing pipes, tubes, and various other articles, from metallic and other substances." Filed 28th February, 1838.

Joshua John Lloyd Margary,—ditto to patent dated 19th December, 1837, for "a new mode of preserving animal and vegetable substances from decay." Filed 4th May, 1838.

John Melville,—ditto to patent dated 8th February, 1838, for "improvements in the generation of steam, and in the application of steam or other power to navigation." Filed 9th May, 1838.

Edward Davy,—ditto to patent dated 13th January, 1838, for "improvements in saddles and harness for horses, and in seats for carriages." Filed 12th July, 1838.

Hippolyte François Marquis De Bouffet Montauban,—ditto to patent dated 28th February, 1838, for "certain improvements in the means of producing gas for illumination, and in apparatus connected with the consumption thereof." Filed 30th August, 1838.

John Sharp,—ditto to patent dated * Filed 10th September, 1838.

John Seaward,—ditto to patent dated 10th March, 1838, for "an improvement or improvements in steam-engines." Filed 18th September, 1838.

Samuel Seaward,—ditto to patent dated 21st May, 1838, for "certain improvements in steam-engines." Filed 19th November, 1838.

Richard Goodridge,—ditto to patent dated 14th June, 1838, for

* This memorandum of alteration recites neither the date nor title of the patent.—Ed.

"a new or improved apparatus for lifting or raising fluids on water or on land, and for marine propelling purposes, without steam." Filed 28th November, 1838.

John Whitehead,—ditto to patent dated 5th November, 1835, for "certain improvements in scouring and cleansing." Filed 28th Noxember, 1838.

James Hellewell,—ditto to patent dated 28th November, 1835, for "an improved process or manufacture, whereby the texture of cotton and certain other fabrics and materials may be rendered impervious to water." Filed 11th December, 1838.

John Henry Cassell,—ditto to patent dated 4th* April 1834, for "a cement or combination of materials, applicable to the purpose for which cement, stone, brick, or other similar substances, may or can be used." Filed 17th December, 1838.

Elijah Galloway,—ditto to patent dated 2nd July, 1829, for "certain improvements in steam-engines, and for machinery for propelling vessels, which improvements are applicable to other purposes." Filed 17th December, 1838.

Richard Treffry,—ditto to patent dated 23rd July, 1838, for "certain improvements in the method of preserving certain animal and vegetable substances from decay; and also in the apparatus for and mode of impregnating substances to be preserved." Filed 22nd January, 1839.

John Read,—ditto to patent dated 19th August, 1833, for "certain improvements in machinery or apparatus for raising or forcing fluids." Filed 9th February, 1839.

William Losh,—ditto to patent dated 31st August, 1830, for "certain improvements in the construction of wheels for carriages to be used on railways." Filed 22nd February, 1839.

Richard Edwards,—ditto to patent dated 6th December, 1830, for "an improvement on, or substitute for, glass and emery, and other scouring paper or substances." Filed 16th March, 1839.

Abraham Bury,—ditto to patent dated 3rd November, 1838, for

* This must be an error in the disclaimer, as the patent is dated 19th April.—Ed.

"certain improvements in the mode of printing, colouring, or dyeing cotton or other fabrics, and in the mode of producing a certain acid or acids, applicable to these or other purposes." Filed 2nd May, 1839.

Francis Pettit Smith,—ditto to patent dated 31st May, 1836, for "an improved propeller for steam and other vessels." Filed 24th May, 1839.

Henry William Craufurd,—ditto to patent dated 29th April, 1837, for "an improvement in coating or covering iron and copper for the prevention of oxydation." Filed 14th June, 1839.

James Carpenter and John Young,—ditto to patent dated 18th January, 1830, for "certain improvements on locks and other securities applicable to doors and other purposes." Filed 16th July, 1839.

William Hickling Burnett,—ditto to patent dated 8th January, 1839, for "new and improved machinery for sawing, planing, grooving, and otherwise preparing or working wood for certain purposes." Filed 6th November, 1839.

William Maugham,—ditto to patent dated 22nd March, 1836, for "certain improvements in the production of chloride of lime and certain other chemical substances." Filed 14th November, 1839.

William Quiglay and James Templeton,—ditto to patent dated 25th July, 1839, for "a new and improved mode of manufacturing silk, cotton, woollen, and linen fabrics." Filed 13th December, 1839.

John Wright,—ditto to patent dated 18th June, 1839, for "certain improvements in mixing or alloying iron with other metals, for the purpose of increasing its strength, tenacity, or cohesion; which alloys, among many other uses, are particularly applicable to the construction or manufacture of links for chains and rings; and certain machinery for effecting such manufacture." Filed 18th December, 1839.

William Gossage,—ditto to patent dated 8th May, 1838, for "certain improvements in manufacturing sulphuric acid." Filed 3rd January, 1840.

Thomas Clark and Charles Clark,—ditto to patent dated 25th May, 1839, for an invention of glazing and enamelling cast iron hollow ware and other metallic substances." Filed 6th April, 1840.

Charles Cowan,---ditto to patent dated 3rd January, 1840, for "improvements in machinery used in the manufacture of paper." Filed 2nd July, 1840.

Samuel Roscoe Bakewell,---ditto to patent dated 18th February, 1831, for "certain improvements in machinery, apparatus, or implements to be used in the manufacture of bricks, tiles, and other articles to be formed or made of clay or other plastic materials, part of which said machinery is also applicable to other useful purposes." Filed 15th August, 1840.

Matthew Heath,---ditto to patent dated 11th October, 1838, for "improvements in clarifying and filtering water, beer, wine, and other liquids." Filed 15th September, 1840.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th October to the 17th of December, 1842, inclusive.

To Joseph Whitworth, of Manchester, in the county of Lancaster, engineer, for certain improvements in machinery or apparatus for cleaning roads, and which machinery is also applicable to other similar purposes.—Sealed 1st November.

Claude Edward Deutsche, of Fricour's Hotel, St. Martin's-lane, in the county of Middlesex, Gent., for improvements in combining materials, to be used for cementing purposes, and for preventing the passage of fluids; and also for forming articles of such composition of materials,—being a communication from a certain foreigner, residing abroad.—Sealed 7th November.

John Cox, of Gorgie Mills, near Edinburgh, tanner and glue manufacturer, for improvements in the processes of tanning and leather dressing.—Sealed 9th November.

James Pilbrow, of Tottenham Green, in the county of Middlesex, engineer, for certain improvements in the application of steam, air, and other vapours and gaseous agents, to the production of motive power; and in the machinery by which the same is effected.—Sealed 18th November.

John Mitchell, of Birmingham, in the county of Warwick, steel pen manufacturer, for a certain improvement in the manufacture of metallic pens, and a certain improvement in the manufacture of pen-holders.—Sealed 5th December.

John Spinks, the Younger, of John-street, Bedford-row, in the county of Middlesex, Gent., for an improved apparatus for giving elasticity to certain parts of railway and other carriages, requiring the same,—being a communication from abroad.—Sealed 5th December.

Matthew Gregson, of Toxteth Park, Liverpool, in the county of Lancaster, Esq., for improvements applicable to the sawing or cutting of veneers,—being a communication from abroad.—Sealed 10th December.

List of Patents

Granted for SCOTLAND, subsequent to November 22nd, 1812.

To Thomas Wrigley, of Bridge Hall Mills, Bury, Lancashire, paper manufacturer, for certain improvements in machinery for manufacturing paper.—Sealed 28th November.

William Coley Jones, of Vauxhall Walk, in the parish of Lambeth, in the county of Surrey, chemist, for improvements in treating or operating upon a certain unctuous substance, in order to obtain products therefrom, for the manufacture of candles, and other purposes.—Sealed 7th December.

Charles Maurice Elizee Sautter, of Austin Friars, in the city of London, Gent., for improvements in the manufacture of sulphuric acid,—being a communication from abroad.—Sealed 7th December.

Don Pedro Pouchant, of Glasgow, civil engineer, for a certain improvement or improvements in the construction of machinery for manufacturing sugar.—Sealed 7th December.

Charles Heard Wild, of Birmingham, in the county of Warwick, engineer, for an improved switch, for railway purposes.—Sealed 7th December.

John Browne, of Charlotte-street, Portland-place, in the county of Middlesex, Esq., for improvements in the manufacture of mud-boots and overalls.—Sealed 7th December.

William Coley Jones, of Vauxhall-terrace, in the county of Surrey, practical chemist, and George Fergusson Wilson, of Vauxhall, in the same county, Gent., for improvements in operating upon certain organic bodies or substances, in order to obtain products or materials therefrom, for the manufacture of candles and other purposes.—Sealed 7th December.

William Losh, of Newcastle-on-Tyne, Esq., for improvements in the construction of wheels for carriages and locomotive engines, intended to be employed on railways.—Sealed 9th December.

Thomas Cardwell, of Bombay, in the East Indies, merchant, for improvements in the construction of presses, for compressing cotton and other articles.—Sealed 9th December.

Charles Augustus Preller, of East Cheap, in the city of London, merchant, for improvements in machinery for preparing, combing, and drawing wool and goats' hair,—being a communication from abroad.—Sealed 9th December.

Thomas Seville, of Royton, in the county of Lancaster, cotton spinner, for certain improvements in machinery used in the preparing and spinning of cotton, flax, and other fibrous substances.—Sealed 9th December.

William Young, of Queen-street, in the city of London, lamp-maker, for improvements in lamps and candlesticks.—Sealed 12th December.

George Edmund Donisthorpe, of Bradford, in the county of York, top manufacturer, for improvements in combing and drawing

wool, and certain descriptions of hair.—Sealed 12th December.

John Bishop, of Poland-street, in the county of Middlesex, jeweller, for improvements in apparatus used for retarding carriages on railways, parts of which are applicable for portioning power; and improvements in steam-cocks or plugs.—Sealed 12th December.

Isham Baggs, of Wharton-street, in the county of Middlesex, chemist, for improvements in the production of light.—Sealed 13th December.

Gabriel Hippolyte Moreau, of Leicester-square, in the county of Middlesex, Gent., for certain improvements in steam-generators.—Sealed 13th December.

John George Bodmer, of Manchester, in the county of Lancaster, engineer, for certain improvements in the manufacture of metallic hoops and tyres for wheels, and in the method of fixing the same for use; and also, improvements in the machinery or apparatus to be employed therein.—Sealed 19th December.

William Lomas, of Manchester, in the county of Lancaster, worsted spinner, and Isaac Shimwell, of the same place, worsted spinner, for certain improvements in the manufacture of fringes, cords, and other similar small wires; and also in the machinery or apparatus for producing the same.—Sealed 21st December.

Moses Poole, of Lincoln's-inn, in the county of Middlesex, Gent., for improvements in dressing mill-stones,—being a communication from abroad.—Sealed 22nd December.

William Palmer, of Sutton-street, Clerkenwell, in the county of Middlesex, manufacturer, for improvements in the manufacture of candles.—Sealed 22nd December.

New Patents
SEALED IN ENGLAND.

To Thomas Mansell, of Birmingham, agent, for certain improved machinery for cutting or shaping leather, paper, linen, lastings,

silks, and other fabrics.—Sealed 3rd December—6 months for inrolment.

Ebenezer Timmis, of Birmingham, manufacturer, for certain improvements in apparatus used for arresting the progress of, and extinguishing fire.—Sealed 3rd December—6 months for inrolment.

Edward Cobbold, of Melford, in the county of Suffolk, clerk, Master of Arts, for certain improvements in instruments for writing or marking, part or parts of which improvements are applicable to brushes for water-color drawings.—Sealed 3rd December—6 months for inrolment.

John Stubbins, of Nottingham, hosier, for improved combinations of machinery to be employed for manufacturing certain parts of articles in stocking or lace fabrics.—Sealed 3rd December —6 months for inrolment.

Don Pedro Pouchant, of Glasgow, civil engineer, for a certain improvement or improvements in the construction of machinery for manufacturing sugar.—Sealed 3rd December—6 months for inrolment.

John Sealy, of Bridgwater, merchant, for an improved tile.—Sealed 3rd December—2 months for inrolment.

Charles Heard Wild, of Birmingham, engineer, for an improved switch for railway purposes.—Sealed 3rd December—6 months for inrolment.

Thomas Howard, of Hyde, Chester, manufacturer, for certain improvements in machinery for preparing and spinning cotton, wool, flax, silk, and similar fibrous material.—Sealed 3rd December—6 months for inrolment.

William Hancock, Jun., of Amwell-street, Gent., for certain improvements in bands, straps, and cords, for driving machinery and other mechanical purposes.—Sealed 3rd December—6 months for inrolment.

Frederick William Etheredge, of Frindsbury, Gent., for certain improvements in the manufacture of bricks, tiles, and other

similar plastic substances.—Sealed 3rd December—6 months for inrolment.

William Henry Stuckey, of Guildford-street, Esq., for certain improvements in filtering water and other fluids.—Sealed 3rd December—6 months for inrolment.

William Pope, of the Edgware-road, ironmonger, for an improved stove.—Sealed 6th December—6 months for inrolment.

William Oxley English, of Kingston-upon-Hull, distiller, for improvements in purifying spirits of turpentine, spirits of tar, and naptha,—being a communication.—Sealed 8th December—6 months for inrolment.

William Coley Jones, of Vauxhall-terrace, practical chemist, and George Fergusson Wilson, of Vauxhall, Gent., for improvements in operating upon certain organic bodies or substances, in order to obtain products or materials therefrom, for the manufacture of candles and other purposes.—Sealed 8th December—6 months for inrolment.

William Smith Harris, and Septimus Hamel, both of Leicester, cotton winders, and co-partners, for improvements in the manufacture of reels for reeling cotton and linen thread.—Sealed 8th December.—6 months for inrolment.

William Kempson, of the Borough of Leicester, manufacturer, for improvements in the manufacture of muffs, cuffs, ruffs, tippets, mantillas, pellerines, dressing gowns, boots, shoes, slippers, coats, cloaks, shawls, stocks, cravats, capes, boas, caps, bonnets, and trimmings for parts of dress.—Sealed 8th December—6 months for inrolment.

George Purt, of St. Mary-at-Hill, soda-water manufacturer, and William Hale, of Woolwich, engineer, for improvements in producing aerated liquors.—Sealed 8th December—6 months for inrolment.

Richard Barber, of Leicester, reel manufacturer, for improvements in the manufacture of boots, shoes, and clogs.—Sealed 8th December—6 months for inrolment.

John George Bodmer, of Manchester, engineer, for certain improvements in the manufacture of metallic hoops and tyres for wheels, and in the method of fixing the same for use; and also, improvements in the machinery or apparatus to be employed therein.—Sealed 8th December—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in the construction and arrangement of axles and axletrees for carriages, carts, and other vehicles, used on rail or other roads,—being a communication.—Sealed 8th December—6 months for inrolment.

William Lomas, of Manchester, worsted spinner, and Isaac Shinnwell, of the same place, worsted spinner, for certain improvements in the manufacture of fringes, cords, and other similar small wares; and also in the machinery or apparatus for producing the same.—Sealed 8th December—6 months for inrolment.

John Grantham, of Liverpool, engineer, for certain improvements in the constructions and arrangements of the engines and their appendages, for propelling vessels on water.—Sealed 8th December—6 months for inrolment.

James Brown, of Soho, Birmingham, engineer, for certain improvements in steam-engines and steam propelling machinery. —Sealed 8th December—6 months for inrolment.

Benjamin Fothergill, of Manchester, machine maker, for certain improvements in machines, called mules, and other machines for spinning, cotton, wool, and other fibrous substances.—Sealed 8th December—6 months for inrolment.

Percival Moses Parsons, of Waterloo-road, Surrey, civil engineer, for certain improvements in steam-engines and boilers, and in motive machinery connected therewith.—Sealed 8th December—6 months for inrolment.

Charles Keene, of New Bond-street, hosier, for improvements in

the manufacture of hose, socks, drawers, gloves, mitts, caps, comforters, and cuffs.—Sealed 15th December—6 months for inrolment.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in the manufacture of candles.—Sealed 15th December—6 months for inrolment.

Thomas Cardwell, of Bombay, in the East Indies, merchant, for improvements in the construction of presses, for compressing cotton and other articles.—Sealed 15th December—6 months for inrolment.

Moses Poole, of Lincoln's-inn, Gent., for improvements in dressing mill-stones,—being a communication from abroad.—Sealed 15th December—6 months for inrolment.

Charles Maurice Elizee Sautter, of Austin Friars, London, for improvements in the manufacture of sulphuric acid,—being a communication.—Sealed 15th December—6 months for inrolment.

Guillaume Simon Richault, of the Sabloniere Hotel, Leicester-square, editor of music, for improvements in apparatus for exercising the fingers of the human hand, in order to facilitate their use in the playing of the piano-forte and other instruments,—being a communication.—Sealed 15th December—6 months for inrolment.

James Winchester, of Noel-street, hatter, for certain improvements in steam boilers, and in the method of applying steam or other power to locomotive purposes.—Sealed 15th December—6 months for inrolment.

Edward Robert Rigby, and Charles John Rigby, of Gracechurch-street, brush manufacturers, and co-partners, for an improvement or improvements in the manufacture of certain articles in which bristles have been or are now used.—Sealed 21st December—6 months for inrolment.

Gabriel Hippolyte Moreau, of Liecester-square, Gent., for cer- improvements in steam-generators.—Sealed 21st December—6 months for inrolment.

Gabriel Hippolyte Moreau, of Leicester-square, Gent., for certain improvements in propelling vessels.—Sealed 21st December—6 months for inrolment.

John Squire, of Ponghill, Cornwall, engineer, for certain improvements in steam-boilers or generators.—Sealed 21st December—6 months for inrolment.

Taverner John Miller, of Millbank-street, Westminster, oil merchant, for improvements in apparatus for supporting a person in bed or when reclining.—Sealed 22nd December—6 months for inrolment.

William Bridges, of Birmingham, button tool maker, for certain improvements in buttons.—Sealed 22nd December—6 months for inrolment.

Henry Purser Vaile, late of Fleet-street, Gent., for improvements in combining mechanical instruments, for obtaining power.—Sealed 22nd December—6 months for inrolment.

Joseph Beaman, of Smethwick, Staffordshire, iron-master, for an improvement in the manufacture of malleable iron.—Sealed 22nd December—6 months for inrolment.

William Godfrey Kneller, of Wimbledon, chemist, for improvements in the manufacture of soda, in the evaporation of brine, and in the concentration and manufacture of sulphuric acid.—Sealed 22nd December—6 months for inrolment.

Robert Wilson, Manager at the Works of Messrs. Naysmiths, Gaskell, and Co., at Patricroft, near Manchester, engineer, for certain improvements in locomotive and other steam-engines. Sealed 22nd December—6 months for inrolment.

James Morris, of Cateaton-street, London, merchant, for certain improvements in locomotive and other steam-engines.—Sealed 22nd December—6 months for inrolment.

CELESTIAL PHENOMENA FOR JANUARY, 1843.

D.	H.	M.	
1			Clock before the sun, 3m. 43s.
—			☽ rises 8h. 37m. M.
—			☽ passes mer. 0h. 41m. A.
—			☽ sets 4h. 52m. A.
1	20	39	♃ in conj. with the ☽ diff. of dec. 2. 10. S.
2	22	19	☿ in conj. with ♄ diff. of dec. 2. 15. S.
5			Clock before the sun, 6m. 1s.
—			☽ rises 10h. 12m. M.
—			☽ passes mer. 4h. 22m. A.
—			☽ sets 10h. 44m. A.
6			Occul 16 Piscium, im. 7h. 32m.
6	14	43	Her. in conj. with the ☽ diff. of dec. 6. 24. S.
	16		☽ in Apogee
7			Occul 45 Piscium, im. 11h. 19m.
7	3	58	♄ in conj. with the ☉
7	21	36	♀ stationary
8	8	11	☽ in □ or first quarter.
9	16	38	☿ greatest Hel. Lat. S.
10			Clock before the sun, 7m. 14s.
—			☽ rises 11h. 20m. M.
—			☽ passes mer. 7h. 13m. A.
—			☽ sets 2h. 0m. M.
—			Occul μ Arietis, im. 8h. 3m. em. 9h. 20m.
12	4	36	☿ in conj. with ♃ diff. of dec. 1. 38. S.
13	17		♀ in Perihelion
16	8	27	Ecliptic oppo. or ○ full moon
17			Mercury R. A. 20h. 49m. dec. 19. 38. S.
—			Venus R. A. 17h. 21m. dec. 17. 31. S.
—			Mars R. A. 14h. 37m. dec. 14. 2. S.
—			Vesta R. A. 10h. 2m. dec. 18. 22. N.
—			Juno R. A. 18h. 57m. dec. 13. 21. S.
—			Pallas R. A. 5h. 29m. dec. 29. 27. S.
—			Ceres R. A. 8h. 37m. dec. 30. 6. N.
—			Jupiter R. A. 20h. 21m. dec. 19. 59. S.
—			Saturn R. A. 19h. 17m. dec. 22. 3. S.
—			Georg. R. A. 23h. 43m. dec. 2. 34. S.
—			Mercury passes mer. 1h. 4m.
—			Venus passes mer. 21h. 34m.
—			Mars passes mer. 18h. 51m.
—			Jupiter passes mer. 0h. 36m.
—			Saturn passes mer. 23h. 29m.
—			Georg. passes mer. 3h. 58m.
18	9		☽ in Perigee
19			Occul ε Leonis, im. 17h. 0m. em. 18h. 1m.
20			Clock before the sun, 11m. 16s
—			☽ rises 10h. 34m. A.
—			☽ passes mer. 3h. 23m. M.
—			☽ sets 9h. 20m M.
22	16	44	Ceres in oppo. to the ☉ intens. of light 1·434
23	1	1	☽ in ☾ or last quarter
23	4	44	♀ at greatest brilliancy
	13	50	♂ in conj. with the ☽ diff. of dec. 5. 48. N.
24	19	46	♃ in conj. with the ☉
25			Clock before the sun, 12m. 35s.
—			☽ rises 3h. 57m. M.
—			☽ passes mer. 7h. 48m. M.
—			☽ sets 11h. 35m. M.
26	11	35	♀ in conj. with ☽ diff. of dec. 6. 51. N.
28	8	13	♄ in conj. with the ☽ diff of dec. 0. 32. N.
	16	3	☿ in the ascending node.
29	17	24	♃ in conj. with the ☽ diff. of dec. 2. 48. S.
	21	4	☿ greatest elong. 18. 21. E.
30	0	1	Ecliptic conj. or ● new moon.
30	4	48	Pallas stationary
31	17	30	☿ in conj. with ☽ diff. of dec. 3. 26. S.

The Satellites of Jupiter are not visible this Month, Jupiter being too near the Sun.

J. LEWTHWAITE, Rotherhithe.